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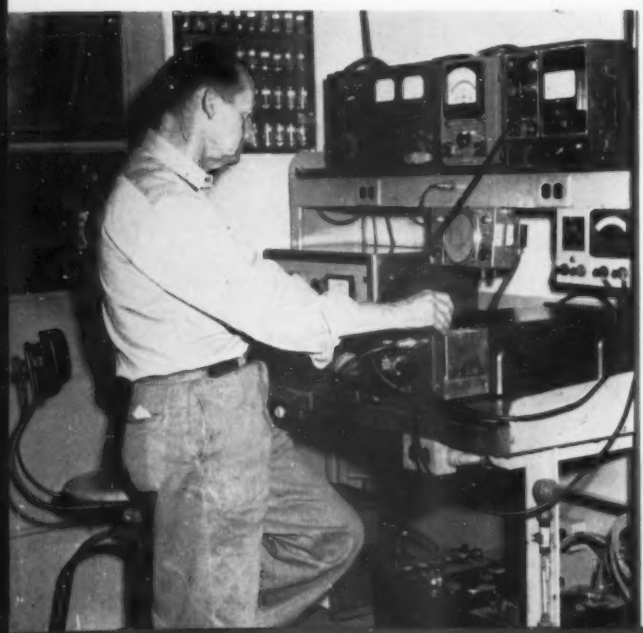

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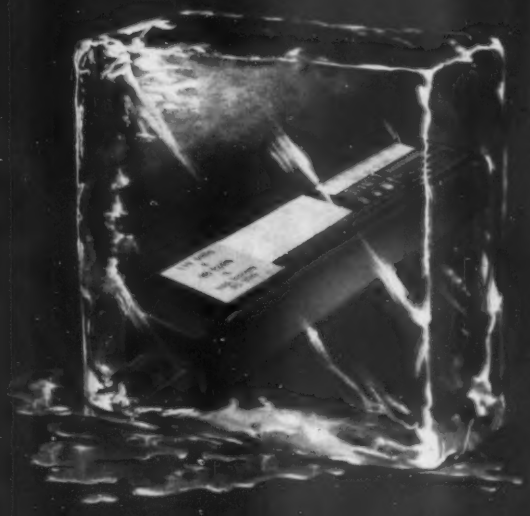

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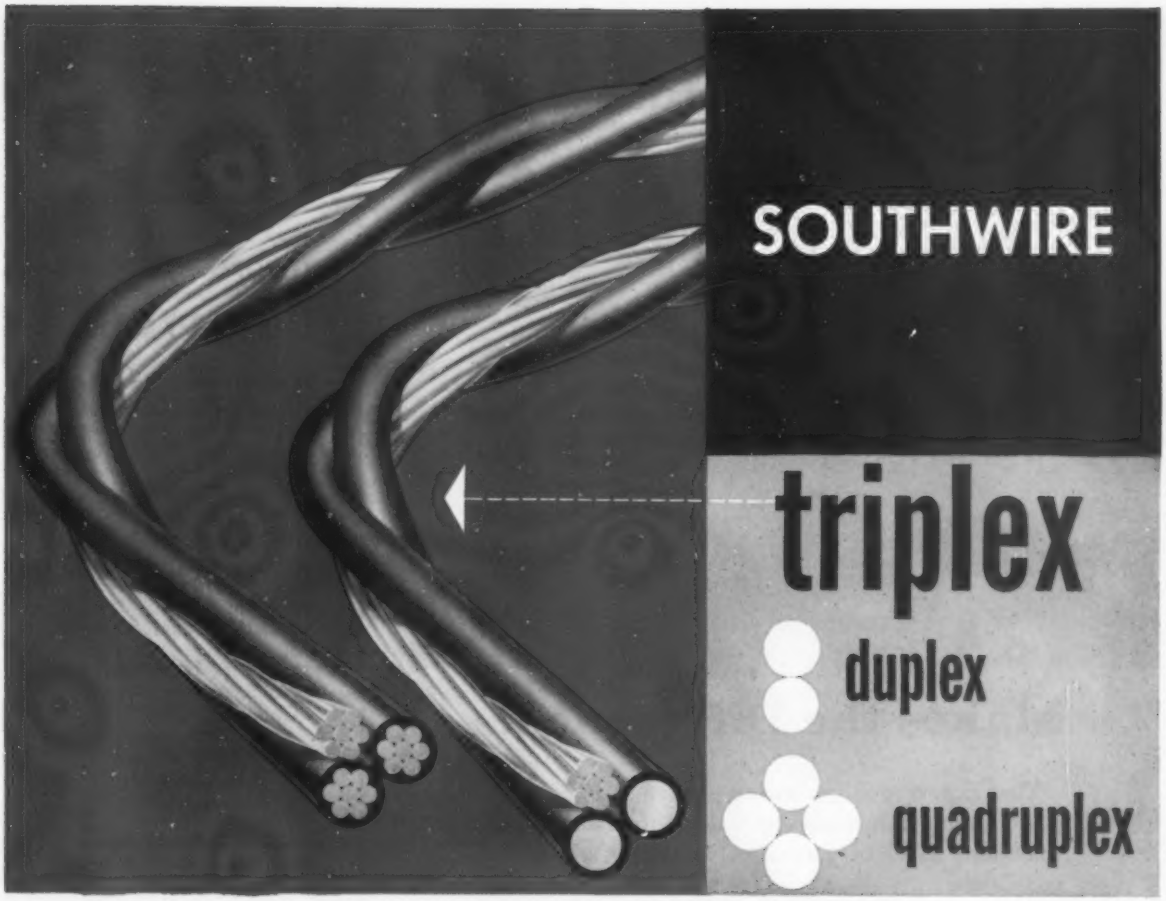

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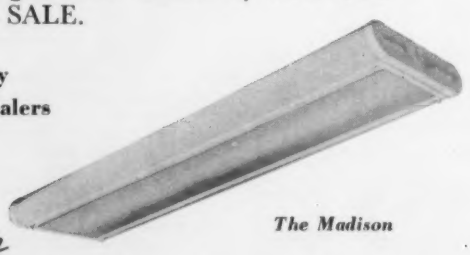

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Workers and the economy

There is still little reason to be overly optimistic about the state of unemployment as yet for the nation continues to face a figure well in excess of five million persons out of work. On a percentage basis of the total labor supply, this figures out to over seven per cent and this is quite high in comparison with the post World War II average.

Economists are quick to point out, however, that approximately half of this figure can be listed as the "chronically unemployed," a situation that is caused by reliance upon a "free enterprise way of life." In other words, the fact that, in our competitive economic society, there is a constant movement of people from job to job and that there are always new industries being organized to replace those that have failed or become obsolete means that on any particular date there will be in excess of three million persons out of work. On this basis of reasoning, the current recession has created only small cause for alarm.

Unfortunately, this is only a part of the story, and it is necessary to dig deeper into the story of unemployment to ascertain the depth of its effect upon current economic conditions. The greater part of the unemployment is found in the durable goods manufacturing plants according to the Bureau of Labor Statistics of the United States Department of Labor.

In fact, during the year ending May 1958, the number of jobless in the nation rose by over two million persons. Of this total, the following breakdown on a percentage basis is of interest: durable goods manufacturing, 63.6 per cent; other manufacturing, 13.6 per cent; and non-manufacturing, 22.8 per cent.

Thus, one important segment of the industrial system has borne the greatest weight of unemployment and recession. It can be further argued that a large proportion of unemployment outside of the durable goods industry can be classified as caused by the drop in buying on the part of the durable goods industry unemployed. However, this does not appear too likely as both available purchasing power and retail sales have remained high throughout the nation.

Unemployment by states

The second factor that deserves recognition is the geographic location where unemployment is most serious. Geographically, nineteen states were heavy hit by reduced manufacturing and employee layoffs. Of these states, five (Indiana, Illinois, Ohio, Wisconsin, and Michigan) accounted for almost a third of those who became unemployed during the year ending as of May 1958.

Roughly, the weight of unemployment has been felt in the area east of the Mississippi River and north of the Ohio and Potomac Rivers. Other sections of the country have felt the sting of layoffs but have not been seriously affected.

The heavy increase in unemployment in the automobile industry has occasioned great difficulty in states such as Michigan where a heavy concentration of such production exists. Further, there is no doubt but that a chain reaction of layoffs occurs in other industries that are closely related to automobile production. However, this has tended to concentrate the effects of the recession within rather strict geographic limits and has allowed other sections to remain relatively free of adverse effects.

The southeast region of the United States is a case in point. It has felt twinges of unemployment and reduced buying but not as seriously as in the northeast region. Moreover, a part of the problem in the southeast is the normal reaction of people who withhold buying until they feel more sure of jobs and the continuity of their wages. If present reports are to be believed, confidence may shortly be restored in the economic health of the nation.

Stock market indecision

The hoped-for pressure of a rising stock market appears to have materialized in recent weeks, but there is little reason to believe that except for a few issues that any real upward movement will be maintained. Many issues have set new 1958 highs during the last few weeks but generally sag a few days later. This period of a seeming price plateau may continue well on to the end of the current year unless certain presently unforeseen factors enter into the picture.

At present, most changes reflect day-to-day waves of optimism or depression and do not signify any prolonged trend. The uncertainties of the course of international affairs (and particularly those centered in the Middle East) will continue to affect price movements. The issues of those industries that are related to such geographic regions by reason of natural resources, such as petroleum, may become even more depressed as tension grows. However, the net effect on the stock market as a whole will probably not be great.

That the market is essentially healthy is proven by the speed with which new issues, particularly government bonds of all types, are distributed to a waiting public. The distribution of new investment fund securities is also a key to the public acceptance of the ultimate strength of the stock market.

Another indication of present and future strength is the apparent willingness of local, state, and national governments to come to the aid of the financially distressed railroads. Recent price increases in rail securities have tended to shore up the weakest parts of the trading lists.

Barring a series of disappointing earnings reports from major corporations in the fourth quarter of the year, one can expect the market to take on a slow upward trend leading general business activity as the economy recovers from the recession condition.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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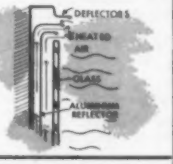

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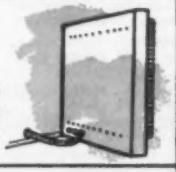

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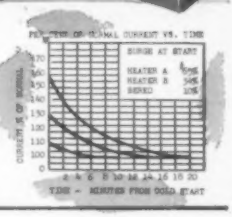

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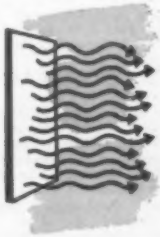

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IAEI, South Carolina Chapter. N. R. Darling, Secretary-Treasurer, P. O. Box 390, Columbia, S. C.

IAEI, Tennessee Chapter. R. E. Ward, Div. of Fire Prevention, 102 State Office Bldg., Nashville 3, Tenn.

IAEI, Texas Chapter. R. L. Payne, Secretary-Treasurer, 3303 Schley St., Dallas, Tex.

IAEI, Texas Gulf Coast Chapter. M. W. McRaven, Secretary-Treasurer, P. O. Box 1700, Houston 1, Tex.

IAEI, Southern Section. A. M. Miller, Secretary, 910 West 30th St., Richmond 25, Va.

IAEI, Virginia Chapter. A. M. Miller, Secretary, Treasurer, 910 West 30th St., Richmond 25, Va.

IAEI, West Virginia Chapter. H. L. Parks, Secretary-Treasurer, P. O. Box 626, Charleston, W. Va.

MOTOR REPAIR SHOPS

National Industrial Service Association, Inc. Joseph M. Harrington, Executive Secretary, 818 Olive St., St. Louis 1, Mo.

NISA, Southeastern Chapter. Mrs. Virginia Oehmann, Executive Secretary, 19 N. W. Fifth St., Fort Lauderdale, Fla.

NISA, Electric Motor Service Association of the District of Columbia. John W. Lainhart, Secretary, 913 E. St., NW, Washington 4, D. C.

NISA, Louisville Chapter. W. C. Krauth, Secretary, 118 S. 1st St. Louisville, Ky.

NISA, New Orleans Chapter. William Dreis, Secretary, 1517 Calliope St., New Orleans, La.

NISA, Mid-South Chapter. Murphy G. Miller, Secretary, 109 Jennings Ave., Knoxville 17, Tenn.

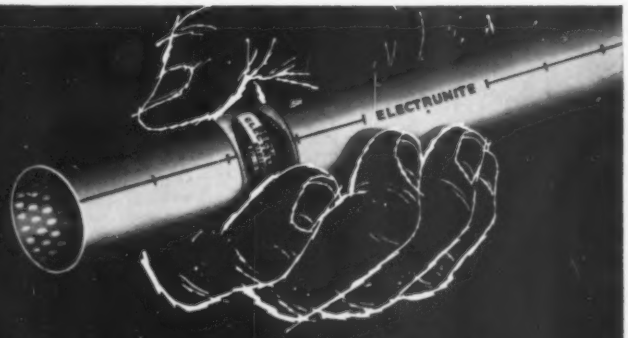
NISA, Southwestern Chapter. George Foshee, Secretary, 203 S. Main, Fort Worth 4, Tex.

NISA, Electric Club of West Virginia. O. E. Jenkins, Secretary c/o Guyan Machine Co., Logan, W. Va.

more contractors use
Republic ELECTRUNITE E. M.T. because...

THE BEST COSTS LESS INSTALLED

Apartment Building: Carlton Plaza, Kansas City, Missouri
Architect: Herbert E. Duncan, Kansas City, Missouri
Electrical Contractor: Twin City Electric Company
Kansas City, Missouri



Department Store: Wm. Taylor Son & Company, Cleveland, Ohio
Architect: Welton Becket, F.A.I.A. and Associates, Los Angeles, California

Junior-Senior High School: Hampton Township School District, Allegheny County, Pennsylvania
Architect: Celli-Flynn, McKeesport, Pennsylvania
General Contractor: Perry J. Dick, Inc., Large, Pennsylvania
Electrical Contractor: Reno Electric Company, Pittsburgh, Pennsylvania

In all types of construction—Republic ELECTRUNITE® E.M.T. provides installation economies that help you make a profit on the job.

Bending quality is built-in! Republic ELECTRUNITE E.M.T. is manufactured by one integrated producer. It is made from highest quality new billet flat-rolled steel. Ductility is protected throughout all manufacturing processes from ore to finished product.

Other installation economies are built-in, such as exclusive "INSIDE-KNURLING", the "ball bearing like" surface that reduces friction—makes wire pulling as much as 30% easier.

Only Republic ELECTRUNITE E.M.T. is "INCH-MARKED"® in feet and inches on all sizes up to 1¼" for fast, accurate measuring. And Republic ELECTRUNITE E.M.T. is "GUIDE-LINED" from end-to-end to keep bends in line, avoid "wows", and eliminate wasted time and wasted materials.

ELECTRUNITE E.M.T. meets Underwriters' Laboratories Standards, Federal Specification WW-T-806 (latest revisions), A.S.A. Specification C.80.3.

For immediate delivery or information, call your local Republic ELECTRUNITE Distributor.

REPUBLIC STEEL
STEEL AND TUBES DIVISION
REPUBLIC STEEL
Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-6062-A
227 EAST 131ST STREET • CLEVELAND 8, OHIO

I would like to learn more about Republic ELECTRUNITE features and installation advantages.

Name_____ Title_____
Company _____
Address _____
City_____ Zone____ State_____

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

1086—Cable Connectors
Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

1088—Fittings and Fixtures
A 32-page illustrated catalog covering Killark fittings and fixtures is offered by Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis 13, Mo.

1092—Electrical Boxes
Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.

1136—Space Heating Guide
Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations on Electric Space Heating. It is based on study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and estimating operating costs. The booklet contains discussion, charts, and floor plan examples.

1166—Electrical Fittings
A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings, and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.

1190—Electrical Fittings
Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.

1192—Wire Pulling Lubricant
Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.

1214—General Catalog
General catalog of Royal Electric Corporation, Pawtucket, R. I. covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealer catalogs may be secured from Royal distributors.

1218—Carbon Products
A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.

1224—Electrical Equipment
The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog Con 15-0 and Bulletin W. C. B. 53-1, containing data on their lines of Safety Switches, Service Equipment, Distribution Panels and "E-Z-RED" Circuit Breakers.

1230—Compression Connectors
An illustrated 18-page bulletin (13A) describes Squeezon compression connectors for all overhead distribution connections from line wire to ground rod. Offered by James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., the bulletin also describes the mechanical and hydraulic installation tools required and tells where to use each.

1238—Selecting Fuses
A 12-page descriptive handbook "Fuseology" tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses—how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.

ELECTRICAL SOUTH
806 Peachtree St., NE
Atlanta 8, Ga.

August, 1958

Gentlemen:

Please send me the bulletins and catalogs indicated.
(Print Plainly)

Name ..... Title .....

Company .....

Address .....

City & State .....

Circle numbers below. Bulletins and catalogs will be mailed promptly.

1086	1088	1092	1136	1166
1190	1192	1214	1218	1224
1230	1238	1240	1244	1250
1254	1266	1268	1300	1306
1308	1312	1316	1318	1320
1322	1324	1326		

B-M THE ORIGINAL INDENTER FITTINGS

Over 25 Years of Proven Performance

Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work.

BRIEGEL RED THROAT

1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Two quick squeezes with The Briegel Indenter and BM All Steel Indenter Fittings are set forever. Metal is pressed into metal for permanent installation and positive ground.

NEW POCKET SIZE INDENTERS

Just 10" long, these new patented compound leverage indenters are only plier size. Lighter to carry and easier to use—the leverage does the work. No. 607 for ½" and No. 608 for ¾" fittings.

BRIEGEL METHOD TOOL COMPANY

GALVA, ILLINOIS

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

Sightline® FOR SEEING COMFORT

A TOTALLY NEW INDIRECT LIGHTING SYSTEM

Aluminum extrusions absorb ballast noise and dissipate heat

Bonderite treated for corrosion resistance

UL approved wireway for 60° circuit wiring

Snap-out plastic guaranteed against discoloration

Patented 45° swivel suspension system

Heavy gauge, die-formed, slotted reflector

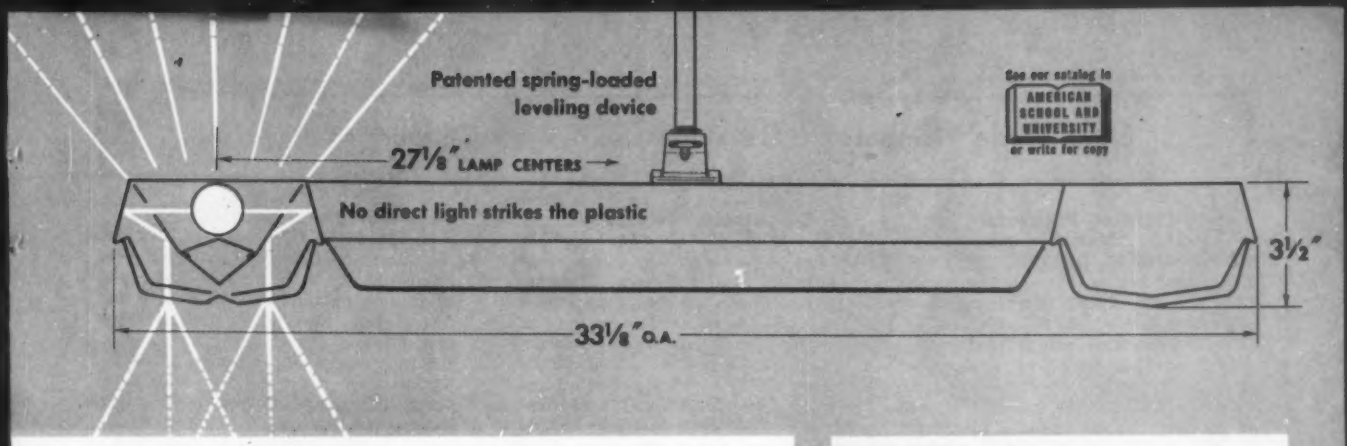
Rigid end plates for perfect alignment

27 ⅛" wide lamp spacing

All-white appearance blends with ceiling

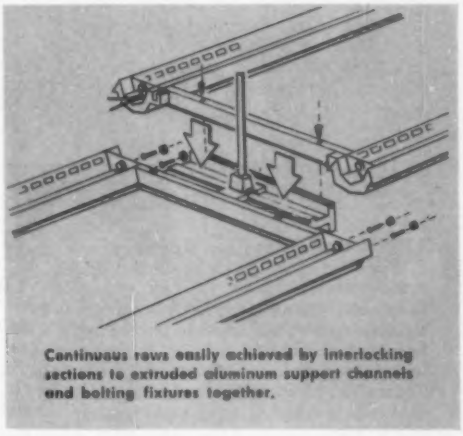
Snap-out ballast enclosure covers

Patents Pending


Patented spring-loaded leveling device
27⅛" LAMP CENTERS
No direct light strikes the plastic
3½"
33⅛" O.A.
See our catalog in AMERICAN SCHOOL AND UNIVERSITY or write for copy

A truly integrated, totally indirect lighting system, Sunbeam SIGHTLINE® is engineered to produce high intensity illumination with minimum "overhead" contrasts resulting in the most comfortable, glare-free seeing conditions. This is especially important in areas where visual tasks are critical. SIGHTLINE® excels in every respect to ASA School Lighting Standards. Crisp, clean, airy styling and thin, widely spaced cross channels of the all-white SIGHTLINE® system blends inconspicuously with most interiors. High efficiency of 82%, extremely low brightness of less than 100 ft-Lamberts on ribbed plastic diffuser and minimum maintenance means long-term economy. No direct light strikes the snap-out plastic assuring long life and freedom from discoloration.
The extruded aluminum cross channels provides more than solid support to the SIGHTLINE® system. They also effectively minimize ballast hum and dissipate ballast heat. A strong, test-proven suspension system with patented 45° swivels top and bottom allows maximum installation flexibility. An aluminum-alloy casting at the bottom incorporates a spring-loaded, self-leveling device and a finger-controlled fine vertical adjustment feature. For utmost simplicity, the SIGHTLINE® is easily ordered by complete rows as required by room size and lighting level desired.

Don't write your next "spec" until you've seen our complete brochure #A-2a.



Continuous rows easily achieved by interlocking sections to extruded aluminum support channels and bolting fixtures together.

Absolutely no glare, either direct or reflected, comes from SIGHTLINE® illumination. SIGHTLINE® illumination permits maximum visual acuity with no loss of contrasts at seeing task. SIGHTLINE® excels in every respect to ASA School Lighting Standards.

Sunbeam Lighting Company, 777 East 14th Pl., Los Angeles 21, California & Gary, Indiana

Enter Code Numbers of Catalogs Desired on Coupon on Page 8

1240—Lighting Fixtures

Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif., now has available a 36-page color catalog, No. 31-F, describing their complete line of lighting fixtures including recessed series and accessories, surface series and accessories, exit light, and aisle lights. Dimensional drawings are shown for each fixture.

1244—New Electrical Fittings Catalog

Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, straps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.

1250—Electrical Enclosures

Catalog No. 5354 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta, Ga., is a well-organized compact 94-page manual giving complete descriptive information, prices, and specifications on all items in the B & C line of electrical enclosures. Copies are available free of charge to electrical contractors.

1254—Construction Anchors

"Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.

1266—Metal-Clad Switchgear

Detailed information on metal-clad switchgear is now available in two special bulletins, 700-B and 7004-C. These booklets give descriptions, application data and specifications on units up to 15 kv and 500,000 kva interrupting capacity. Wire I-T-E Circuit Breaker Co., 19th and Hamilton St., Philadelphia 30, Pa.

1268—Lighting Fixtures

The Perfeclite Co., 1457 East 40th Street, Cleveland 3, Ohio, makes available the following literature: (1) Data Folder 54-B — 4 pages of engineering information, prices and specifications on Plastic Indirect Concentric Ring Luminaires. (2) Data Folder EX-57 — 10 pages of information on Exit Units for all building locations. Complete Engineering data and prices given. (3) Data Folder 56-A — Information on Ceiling Pan Fixtures and Vapor Proof Prismatic Exterior Fixtures. (4) Data Folder 58-A on Concrete Mounting Boxes for recessed incandescent units. (5) Data Folder 58-B on Fluorescent Exit Units. (6) Data Folder 58-C on Phosphorescent Exit Units. (7) Data Folder 57-A on extra shallow recessed units and square ceiling pans.

1300—Lighting Control Switch

The Arrow-Hart and Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., offers a one-page information sheet on their new quiet, tap action, lighting control switch, designed to fit any standard toggle wall plate.

1306—Fasco Fans

Fasco Industries, Inc., North Union and Augusta Sts., Rochester 2, New York offers two 8-page catalogs; one describing their window, hassock and oscillating fans, and the other describing their ventilating fans.

1308—Cable Spinners

A complete data file on aerial cable spinners and tools is available from Cable Spinning Equipment Co., 3100 Topeka Blvd., Topeka, Kansas. The file includes reprints of pertinent articles, operating instruction book, and price list.

1312—Killark Fittings

A new catalog section covers Killark plugs and receptacles in two basic designs: explosion-proof and weatherproof. This new line offers many advantageous features, and is available in many styles and sizes to fit various boxes. Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis, Mo.

1316—Electric Heating

Electromode Division of Commercial Controls Corp., 570 Culver Rd., Rochester 3, N. Y., is now offering their new catalog EC-199 describing a complete line of electric heaters and heating systems for the home. Descriptions, specifications and illustrations are included for wall and portable heaters for large and small rooms, radiant panel heaters, baseboard heaters and radiant cable heat.

1318—Power Bender

The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.

1320—Bending Equipment

A concise eight-page brochure has been made available from Tal Bending Equipment, Inc., 417 N. Water St., Milwaukee 2, Wis., describing their "One Shot" bender line. The Tal bender uses the same frame for standard pipe, copper tubing, radiant heat coils, rigid and thinwall conduit, bus bar, flat, round or square stock—from ⅜ to eight inches.

1322—Fuse Links

Complete information—application, coordination, interchangeability — of fuse links is given in **Fuse Links and How to Use Them**, published by the A. B. Chance Company of Centralia, Missouri. This free 23-page manual includes a packet of standard-time-current-characteristic curves in a back-cover pocket.

1324—Conduit Fittings

Producto Electric Corp., 932 Rogers Place, New York 59, New York have issued a 28-page catalog illustrating their complete line of Peco electric conduit fittings. Items such as ground clamps which Peco has been manufacturing for 24 years are prominently displayed. The new Peco 90° Pull-in ells and Peco Fish Wire in all of the various sizes are also listed.

1326—Wire and Cable

Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

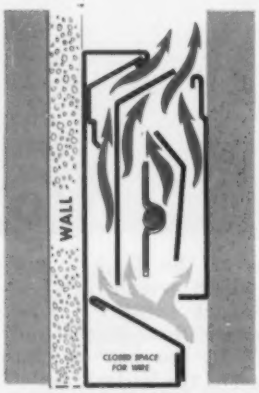
Cavalier improved BASEBOARD with FULLY ENCLOSED ELEMENT

NEW SAFETY Now, Cavalier's Baseboard heating element is **fully enclosed** in tubular steel sheath . . . same type proved so reliable and long-lived on electric ranges. Absolutely no shocks, no burns . . . a Cavalier safety feature that's an extra buying reason for those with children. Maximum surface temperature never exceeds 125° F.—**a Cavalier exclusive feature**—yet heating output is full 200 watts per lineal foot.

EASY ON THE EYE Cavalier is the **architectural** Baseboard with the built-in look that folks want to buy. Keeps new look longer.

COMPLETELY AUTOMATIC ELECTRIC!

The only system ever discovered that puts the heat where it belongs and will make a room comfortable right up to the windows, no matter how large and exposed they are. Reduces window frosting, too.



Vertical fin welded continuously to element sheath helps radiate heat, does not obstruct air flow, Construction eliminates dust traps. Heated air is thrust out into room, away from walls.

SAVE TIME AND MATERIALS Fewer sections required; jobs finished faster. Sections interlock. Only 2 screws per 32" or 48" section needed to fasten to wall. Special build-in convenience outlet sections (duplex 115V), a sales-making feature! Thermostatic control section builds in too. Saves labor and run of wire across room to wall thermostat. No carpentry. Installs on wall surfaces, no recessing.

INDIVIDUAL ROOM TEMPERATURE. High quality, liquid-filled thermostat keeps each room at exact temperature desired, independent of other rooms. Zone control at its best! True perimeter heat, perfectly balanced everywhere in the room, at all levels.

TOPS IN EFFICIENCY Installs at floor level along weatherside walls where it's needed most. Takes advantage of natural rising of heat. No moving parts, nothing to wear out or cause trouble. No profit-robbing callbacks! Write for the newest catalog on Cavalier's complete line of Electric Heating Equipment.

CAVALIER . . . the line that stays ahead!

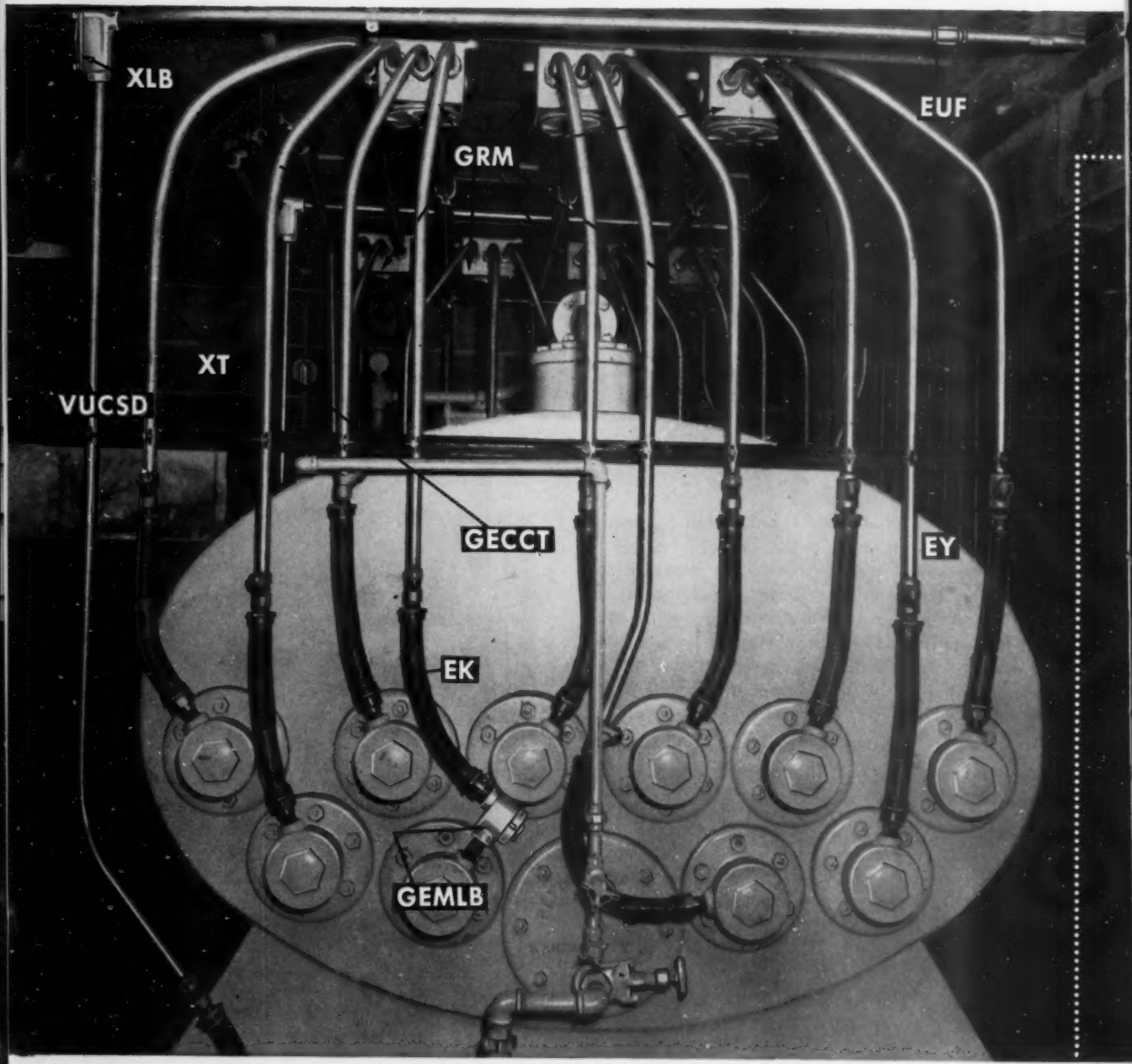
FIRST *in quality construction*
in engineering advances
in safety
in sales making features

HEAT BETTER ELECTRICALLY

OVER 90 YEARS OF QUALITY PRODUCTS

CAVALIER CORPORATION, Electric Heating Division • Chattanooga 2, Tennessee

Oil Treating Plant Specifies



This photo shows one of the Hudson oil treating machines, to which are installed a number of necessary Killark Flexible Couplings. On the ceiling are Killark Explosion Proof Junction Boxes. In the box at the right are enlarged photos of the Killark units used (and numbered) in this installation.

ELECTROLET KILLARK SPEEDOLET

Killark

KILLARK ST. LOUIS

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. St. Louis 13, Missouri

KILLARK Explosion-Proof Fittings

Attractive Alumalloy Construction Offers Protection, Strength, Freedom from Rust and Corrosion

XLB Junction Box

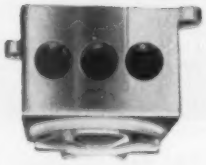
XT Junction Fitting

VUCSD Lighting Fixture

EY Sealing Fitting

GECCT Junction Box

EK Flexible Coupling



GRM Junction Box

EUF Union

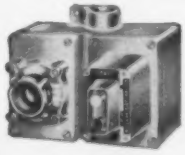
GEMLB Junction Box with Sealing Cover (GEMEY)

The installation shown here is for oil processing equipment at the Hudson Oil Company plant in Kansas City, Kansas. It is significant testimony to the efficient, safe design of Killark Explosion-Proof Fittings that were used throughout the job.

Electrical Contractor—
Great Northern Electric Co., Kansas City, Kansas
Killark Representative—Wm. B. Terry Co., Kansas City, Missouri

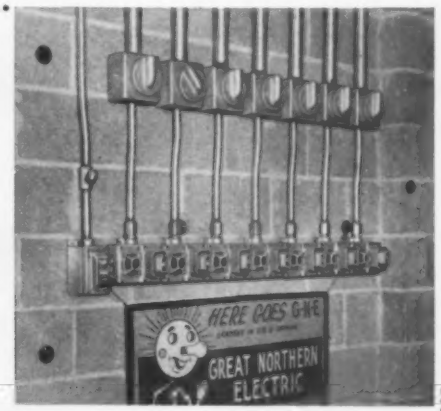
GRD Junction Box (with sealing cover)

EUM Union

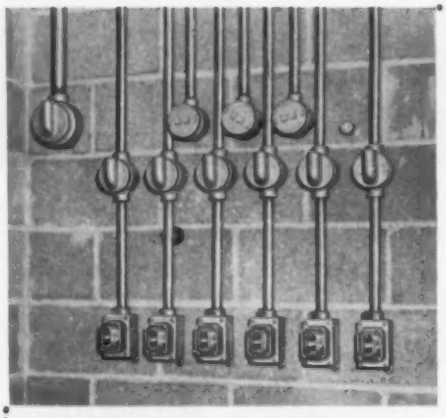


2XPLBM Pilot Light and Push Button Station

EY Sealing Fitting



Battery of push button and pilot light units which operate the oil treating machines. Actual units shown enlarged in the attached inset.



GESLBT with sealing cover

GECLBT Junction Box

GECCT with sealing cover

XPBM Push Button Stations

These "start" and "stop" stations will control operations in other parts of the plant now under construction. Actual units shown enlarged in inset.

Killark Representatives will gladly offer their assistance on design and specifications for your installations.

KILLARK REPRESENTATIVES

ATLANTA 8, — Ernest T. Loyd, Inc., 69 Mills St., N. W.,
BALTIMORE 18, — Leo T. McCourt Co., 11 West 25th St.,
CINCINNATI 37, — Arthur L. Ehlers Co., 1031 Meta Drive,
DALLAS 2, — Geo. E. Anderson Co., 1901 Griffin St.,

Anderson's Newest Hot Line Stirrup Clamps: Series AAS and BBS

Twice as safe . . . twice as secure! Specially designed for use with aluminum (AAS series) or copper (BBS series) primaries. Safe because grippers are permanently attached to the bolt stems . . . can't slip or fall out! Secure because there are two—not one—complete high pressure, high strength clamp systems!

Quick and easy to install, the AAS and BBS give added protection to main cables . . . prevent arcing, pitting, burning, and mechanical damage often found after frequent tap disconnections. Chemically cleaned and pre-inhibited for low contact resistance. Both series available in two sizes, each with choice of two stirrup sizes. Supplied with hex head or eye stem bolts. Cable capacity #8 to 397.5 MCM ACSR (18/1).

ANDERSON ELECTRIC CORPORATION, Birmingham 1, Alabama

Export Representative: International Standard Electric Corp.
50 Church Street, New York 7, New York

ANDERSON ELECTRIC

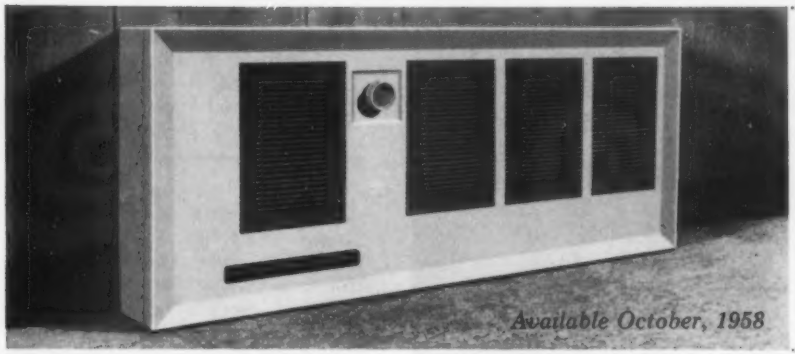
Research / Quality / Performance / in Aluminum and Bronze Products

Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

Big News FROM R&M-HUNTER

Electric Heating-Forced Air Heating-Baseboard Heating- *All in one Packaged Unit!*

FORCED AIR BASEBOARD: A new concept in electric heat



- Remove this R&M-Hunter Baseboard unit from its carton and install in minutes
- No parts to assemble
- No long baseboard sections
- Positive circulation without drafts

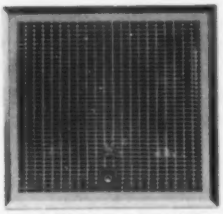
Mr. Contractor, here is electric heat at its best. Best for the home-owner. Best for you. No parts and pieces to assemble. Out-of-line walls are no problem. Just remove the R&M-Hunter Forced Air Baseboard Heater from its package and install in a matter of minutes.

R&M-Hunter Forced Air Baseboard Heaters go in at floor level in either new or existing construction. Frame and facing finished in beige. Heater is available with or without built-in thermostat control. Thermostat model will regulate one or more units.

Tempered air is discharged in an ascending 30° fan pattern. Quiet centrifugal fan recovers floor level air which in turn pulls the warmed ceiling air down into the living zone. Floor and ceiling temperatures are equalized within very close tolerances. Wasteful heat packing at ceiling is minimized.

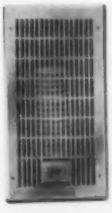
Get the full profit story on R&M-Hunter Forced Air Baseboard Heaters from your distributor. Or write or call for complete information.

PROFIT WITH THESE OTHER R&M-HUNTER QUALITY ELECTRIC HEAT PRODUCTS



Automatic Recessed Wall Heaters

Styled by Sheldon Rutter, these heaters improve room appearance with their fine decorator styling. Beige grille has smart, anodized gold frame. Four capacities: 1500 to 4,000 watts. All models mount flush to wall. Thermostat controlled. Cradled coil element guaranteed 5 years against burn-out. Now available.



Bathroom Heater

Instant radiant heat chases bathroom chill at the flick of a switch. Compact design will fit into crowded space without sacrificing desirable location of fixtures. Sparkling chrome finish. Cradled coil nichrome element guaranteed 5 years. Now available.

Baseboard Heat Sections and Accessories

Provided in 32" and 48" modular lengths. New, improved heating elements, fully enclosed, produce 200 watts per lineal foot. Thermostatic Control Section, Convenience Outlet Sections, End Caps and Corner Pieces combine to make R&M-Hunter Baseboard Sections highly flexible for any space arrangement. Sections only 2-1/16" thick, 6" high. Now available.

R&M HUNTER

HUNTER DIVISION-ROBBINS & MYERS, INC.
2644 Frisco, Memphis, Tenn.
The Peak of Quality

R&M-HUNTER ELECTRIC HEAT . . . *It's Matchless!*

Knoxville Parade of Homes features electric

Electric baseboard heats the lower level of this two story Cape Cod home. Wall units heat the upper level where there are dormers and offsets. Temperatures in each room are individually controlled. Lee F. Reynolds, electrical contractor, and H. E. Rench, builder, inspect the baseboard installation below.

By Warner Ogden

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers

◆ ALL EIGHTEEN of the attractive homes built by different contractors in the 1958 Parade of Homes at Knoxville have various kinds of electric heat. They are symbolic of what is happening at new subdivisions over the South and a growing trend elsewhere in the United States.

Ever since Stuart Fonde first built a subdivision of quality low-cost all-electric homes ($3,100 up, including lot) back in the 1930's, the popularity of electric space heating has increased.

Jack Goans, heating specialist in the commercial department of the Knoxville Utilities Board, figures over 95 per cent of new homes in the service area now are electrically heated. The department cooperates with electrical contractors, builders and others on layouts.

Take the 1958 Parade of Homes as an example of what is being done today. The writer visited each of these new homes while they were being built by members of the Home Builders Association of Knoxville.

Lee F. Reynolds of Reynolds Electric Co., Fountain City, Tenn., was doing the electric heat installation in eight of the homes. And his 63-year-old father, Carson G. Reynolds, was a real expert, quicker than most young men, in personally working on such a job.

Carson is so skilled that he can staple heat cable in ten rooms in only eight hours. Few younger men could do that. His skill is the more remarkable considering that he was crippled in World War I. He just works fast, steady, doesn't talk much and knows what he is doing.

space heating

Reynolds Electric has three trucks, fully equipped for any job, and each with its own radio-telephone to keep in touch with the office and speed dispatching. In a year the company will do between 200 and 250 electric heat jobs, in addition to other home wiring and commercial work.

A difficult job done well by Reynolds Electric was what is called a cathedral ceiling type in one home. The top was about 16 feet up and a scaffold was necessary to reach it. That is in a large home with four bedrooms, two baths, living room, dining room, kitchen, utility room, totaling 1,555 square feet, which was priced at $16,500, including the $1,850 100x150-foot lot in suburban Cumberland Estates. The home was furnished in early American.

"Ninety-five per cent of new homes are putting in ceiling heat or baseboard heat," Lee Reynolds finds. "They find it economical, but the homes must have the right kind of insulation."

On a Cape Cod home in the Parade, the builder, H. E. Rench, had Reynolds Electric put in baseboard electric heat on the lower level and wall heaters on the upper level. At another home in the Parade, Mr. Rench had Reynolds Electric install ceiling heat.

Last year, Reynolds did seven of the electric heat jobs in the 1957 Parade of Homes and also the wiring on the NBC House. All builders were pleased.

Rench explained that in one home he built for the 1958 Parade, ceiling heat was used in all except the bathrooms and wallheaters were used there. "The baths are usually so small that you can't get enough cable in for the required amount of heat to heat the bathroom properly," he said. "That is the reason we put in wallheaters. We used a glow-type instead of a fan heater. A radiant type offsets the movement of air to keep from chilling." That home has 1,056 square feet and sells for $13,000.

In each of the homes Rench built the temperature is individually controlled for each room.

"All of our heat is engineered,"

(Continued on page 111)

William W. Mullendore, Knoxville builder, looks up at a combination electric forced air heating and air conditioning system installed by DeArmond Electric Co. One thermostat is used for heating and cooling.

Carson G. Reynolds staples heating cable to ceiling. An expert and skilled workman, he can complete ten rooms in eight hours.

New low residential electric heating rates serve homes throughout Arkansas.

Comfort, safety, and economy of

By Sophie W. Ellis

This article should be especially helpful to the following readers:

Electrical Contractors	✔
Electric Utilities	✔
Electrical Wholesalers	✔
Electrical Inspectors	✔
Industrial Engineers	
Consulting Engineers	✔

◆ FOR SEVERAL YEARS electrical heating for Arkansas homes and commercial structures has been making fast strides in the rural sections. Now a new element of fast development is gaining force The larger cities, where natural gas rates are low, are accepting electrical heating.

Recent figures released by the Arkansas Power & Light Company reveal that, by the end of 1958, about 500 electrical heating jobs for the year will be completed in areas covered by its service. Some of the increase in the use of electrical resistance heating and the heat pump is due to the utility company's reduced electrical rates for homes having either installation.

A special wintertime rate, extending from November through April, lowers the cost of power for heating by .7¢ per kilowatt hour, a saving of more than one-third. This new rate for residential electric heating reduces the cost per kilowatt hour to 1.2¢ for usage in excess of 500 kilowatts per month.

Electrical power users are pleased with their lowered electrical bills, of course. But this is not the only reason why homes already equipped with fuel-type heating are converting to electricity. Promotions, staged through cooperative efforts of electrical contractors, electric supply wholesalers, and the electric utilities, are turning hundreds of home owners yearly to electrical heating.

Educational efforts

Typical among those electrical contractors who realize that their own educational efforts must combat apathy toward electrical heating in a low gas-rate area is D. H. Houston, owner of the Houston Electric Co., Little Rock.

For several years Houston has been installing electric resistance heating in rural homes that are not serviced with natural gas. But the volume was not what Houston wanted. He saw a vast potential in the 150,000 population of Greater Little Rock, where gas rates are the lowest in the state.

Six months ago he opened fire with an advertising and sales program concentrated on his home town. The results have been so outstanding that a detailed review of this program is interesting.

First of all, he employed a heating specialist, U. D. Moore, to survey, estimate, supervise installations of resistance heating, and then to train the other electricians to assist him in every phase of the work he was doing.

"Many electrical contractors shy away from selling resistant heating," he said, "because they feel that estimating is a formidable problem. This is not true. The start can be made with the heating manufacturers' charts as basic help. Then the aid of the utility company should be accepted with confidence. Arkansas Power & Light Co., in this area, goes all out to help the electrical contractor

Electric heating provides comfort and safety for children in homes at Bald Knob and Earle, Ark.

electric heat promoted in Arkansas

with estimating and installation of electrical heating.

"After the contractor has completed one or two jobs, at an average installation cost of from $300 to $400, he gets the hang of estimating. After those first couple of jobs, he need never fear that he won't come out on the profit end of the sale.

"And it will be a sale. People don't just come to us and say, 'We want electrical heating for our home.' For every job of automatic baseboard heating, heating cable, and built-in electric heaters we install, there is a background of advertising, promotion, and follow-up selling."

Newspaper advertising

The newspaper advertising is concentrated on two months in the spring, March and April, with a more streamlined program at the close of summer. Once a month a quarter-page display advertisement on automatic electric heat appears on the home-and-garden page of the Sunday newspaper. On other Sundays a six-inch two-column insertion is used.

For thirty days in the spring, ten radio spot announcements daily promote electrical resistance heating.

This advertising results in many personal inquiries, usually telephone calls. Each one is followed up with a personal call by the heating specialist and his assistants, who survey the house, check insulation, and estimate the cost. So many prospects were developed by June of 1958 that Houston is using the summer months to close sales for jobs that will be done in the fall.

Electrical Contractor Houston also ties in with the advertising of the Arkansas Power & Light Co., and takes advantage of home shows and other promotional events.

In the words of L. E. Blades, sales supervisor for Arkansas Power & Light, prospects for the growth of electric heating in Arkansas are fabulous. For several years, this utility company has offered supervising service on all electrical heating jobs.

"It has now reached the point," he said, "that we get as many requests for information and help on application as we can care for. Throughout our area, electrical contractors ask us to help. Many of them do not realize that it does not take special background to install resistance heating. They feel inadequate when they approach their first job or two. We have to work closely with them, help them make the preliminary survey, advise regarding insulation, and proper installation."

Mr. Blades revealed that his company produces, through advertising and promotion, 90 per cent of the electrical heating customers served by large and small contractors in the state. Besides advertising regularly in 90 newspapers, the utility company watches building permits, meter changes, and adequate wiring inquiries, all of which produce prospects for electrical heating, the heat pump as well as resistance heating.

One of the most active sources in the state in educating contractors and prospects in regard to electrical space heating is Dorsey Electrical Supply Co., North Little Rock. They have set up an intensive program to educate contractors in the use of electrical

(Continued on page 76)

Electrical space heating methods

By C. Lorentzson

This article should be especially helpful to the following readers:

Electrical Contractors	✔
Electric Utilities	✔
Electrical Wholesalers	✔
Electrical Inspectors	✔
Industrial Engineers	
Consulting Engineers	✔

◆ GEORGIA POWER Company is promoting the heat pump *and* the electric resistance comfort heating with equal force, according to Harry T. Yopp, field supervisor, commercial heating and air conditioning.

"The policy of our company is to promote aggressively all forms of electric space heating as well as industrial process heating," he said. "The heat pump is not favored over electric resistance heating, nor vice versa, principally because individual circumstances will favor one or the other methods of electric space heating and sometimes there is little to choose between heat pumps or resistance heating plus air conditioning. Customer interest should determine the method of heating selected."

Equal allocations justified

The heat pump has been almost universally favored over the electric resistance unit by utility companies all over the country, but Mr. Yopp says there are many reasons why electric resistance heating should get an even break with the heat pump when sales promotion money is allocated.

"First, there are more, many more, potential customers for resistance electric heating than for heat pumps," he said. "Unless a home is to be air conditioned, a heat pump is not indicated. There are far more homes being built without air conditioning than with it, and this will continue to be the case for economic and personal reasons.

"Almost every new home is an electric resistance heating prospect, while this is certainly not the case for heat pumps. Only the higher-priced homes, where air conditioning is a probability are good prospects for this machine."

It is usually thought that the heat pump has a smaller kilowatt demand than resistance heating. However, this is only part of the story Mr. Yopp continued. In those areas north of Florida, most heat pumps (where they are sized for cooling) require from eight to 13 kw of supplementary resistance heating for extremes of cold weather. This load must be considered in transformer capacities.

The result: in most cases, the total connected load on a heat pump is about the same as that for an electric resistance comfort heating job. In addition, the resistance heating installations do not have to be designed to take care of the starting current of the heat pump motor.

One of the strong points in favor of electric resistance heating is that of first costs. Officials of Georgia Power Company believe the lowest cost heating system i electric resistance heating, not a heat pump.

According to Mr. Yopp, this is where most people say, "Yes, but a heat pump provides air conditioning, too!" The answer is that in the cases of most lower- and medium-priced homes there won't be air conditioning, but there will always be a heating system, if not electric, then of some competitive type not using electricity.

Electrical heating resistance units in air conditioning ducts can easily heat almost any building, an application used exclusively for commercial and industrial buildings.

Georgia Power Company has hundreds of installations on record, mostly commercial, where suitable electric heating coils have been installed in present air conditioning ducts; however, selling the heat pump of large size meets sales resistance.

If maintenance costs are considered, resistance heating wins hands down. As Mr. Yopp pointed out, "The plain facts are that electric heating by resistance units

Above are some of the 615 persons attending three electric heating conferences held recently in Atlanta by Georgia Power Co. Architects, engineers, electrical contractors, general contractors, builders, electrical inspectors, industrial firms, active residential and commercial prospects, building loan organizations, banks, and Federal agencies such as the FHA and VA were invited to the meetings to explore the sales possibilities of electric space heating.

promoted equally in Georgia

provides the lowest maintenance cost, the longest life, and the greatest reliability from mechanical failure of any type of heating system."

A comparison of the two heating systems from the standpoint of total "owning" costs, comparing that of a heat pump with that of a good electric resistance comfort heating plus a separate air conditioning system, indicates there is little difference between the two. "Owning costs" are the cost of buying, operating, maintaining, and replacing any item, according to Mr. Yopp.

Comparison of owning costs

Buying cost is comparable, but maintenance and replacement costs for resistance electric heating is less than for a heat pump. For example, a resistance electric heating operating cost of $140.00 per year would indicate a heat pump operating cost for heating of about $70.00.

However, two or three trips a year for maintenance, parts replacement, and adjusting purposes usually comes close to eating up the savings in heat pump operating cost, not counting the inconvenience of being without heat. In addition, the life of the electric heating system is longer than that of a heat pump, says Mr. Yopp, and the amortization cost of the heating portion of the heat pump will be higher than that of electric resistance heating.

Subdivision builders are not interested in heat pumps unless the homes are in the price range where air conditioning can be installed, and even then, they want to make air conditioning optional with the buyer.

There is a better opportunity to sell electric resistance heating to a builder who can then make air conditioning optional than to attempt to sell heat pumps for all homes. All of the builders' prospects want a heating system while a lot of them don't want or cannot afford air conditioning.

Compared to a heat pump, an electric resistance heating system can do a better job of heating, in that it has individual thermostats in each room controlling its own heating element. The temperature of the whole house does not have to be raised to keep one corner room warm. In addition, individual rooms can be maintained at different temperatures, and spare room heating circuits can be easily cut on and off. These are strong points in favor of electric resistance heating, points that appeal to a buying public.

Another most attractive feature of electrical resistance space heating not ordinarily shared by central heat pumps is the great variety of methods and equipment available for satisfactorily heating new buildings and additions to existing buildings.

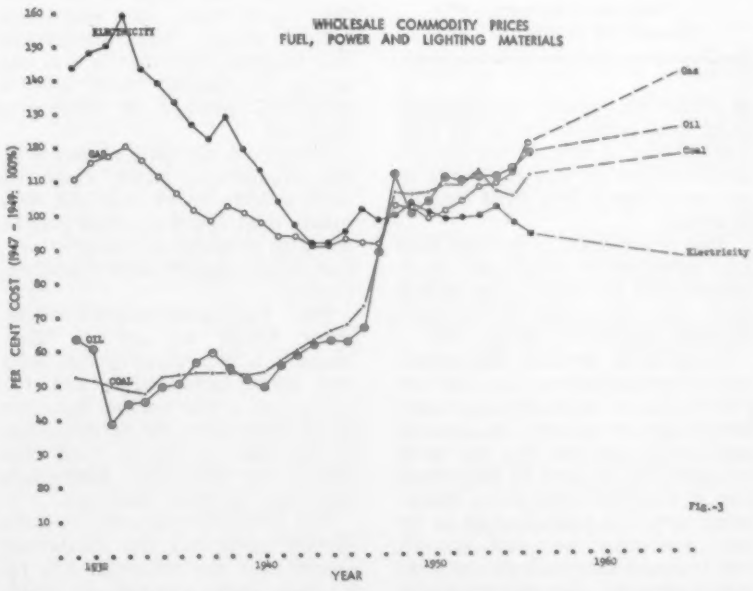
Especially when it comes to heating extra rooms, electric resistance heating units are indicated. When built and insulated properly, these rooms can be heated in this manner satisfactorily. The potential market is large if this method of heating is actively promoted.

"Some electric utilities by their lip service to electric resistance heating, combined by half-hearted sales promotion and direct sales effort, make this superb load builder a second-class way of heating in the eyes of the public," says Mr. Yopp. "These utilities put what money they do spend on an appeal to people with homes in the $20,000-and-up bracket to buy heat pumps, which leaves them with nothing for the great majority of people building homes at more modest prices. Let's make electric heating available for everyone, not restrict it to the middle and upper income families.

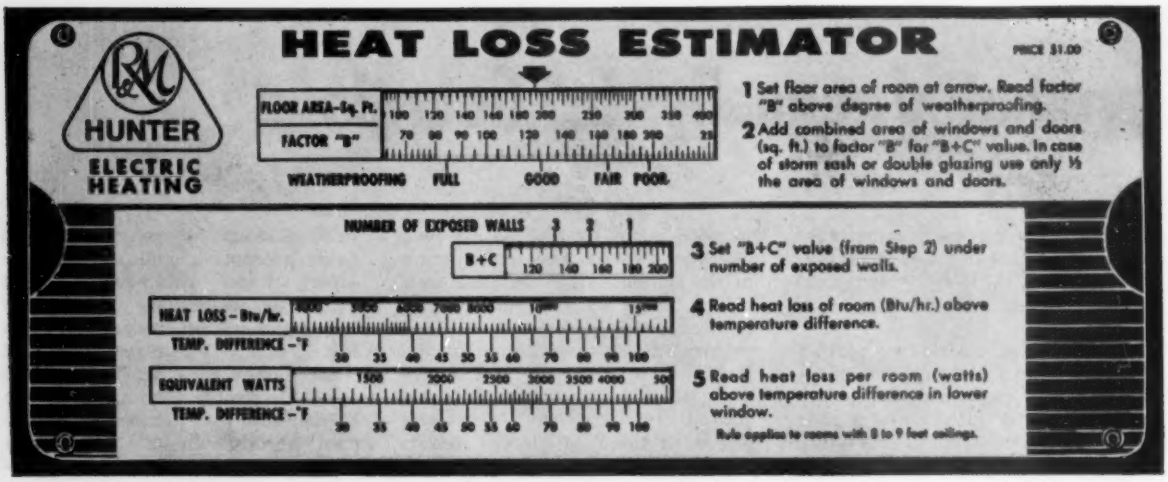
Electric heat vs. fossil fuel

"This tremendous market should be opened to electric heating and heat pumps are not the whole answer," he continued. "The answer is to sell, promote, and encourage electric resistance space heating to the best of our abilities. What I want to see is electric resistance heating promoted and sold as the equal of any other electric heating system and superior to any fossil-fuel system of heating."

(Continued on page 115)



This chart, based on data obtained from the Office of Business Economics, U. S. Department of Commerce, has been used effectively by the power company sales staff in promoting electrical space heating.


HEAT LOSS ESTIMATOR
PRICE $1.00
R&M
HUNTER
ELECTRIC HEATING
FLOOR AREA-Sq. Ft.
FACTOR "B"
WEATHERPROOFING FULL GOOD FAIR POOR
1 Set floor area of room at arrow. Read factor "B" above degree of weatherproofing.
2 Add combined area of windows and doors (sq. ft.) to factor "B" for "B+C" value. In case of storm sash or double glazing use only ½ the area of windows and doors.
NUMBER OF EXPOSED WALLS 3 2 1
B+C
3 Set "B+C" value (from Step 2) under number of exposed walls.
HEAT LOSS - Btu/hr.
TEMP. DIFFERENCE - °F
4 Read heat loss of room (Btu/hr.) above temperature difference.
EQUIVALENT WATTS
TEMP. DIFFERENCE - °F
5 Read heat loss per room (watts) above temperature difference in lower window.
Rule applies to rooms with 8 to 9 foot ceilings.

Heat loss--heat cost estimator

By B. S. Bartholemew

Electric Heating Engineer
Hunter Division, Robbins & Myers Inc.
Memphis, Tenn.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ FIGURING heating requirements is of vital importance to the contractor who is now in the electric heat business or who has made up his mind that it is a field for him to enter.

The importance of correct heat loss calculations cannot be overemphasized for they provide the basis for selecting the proper capacity equipment for the job.

Guessing is perhaps the easiest way to estimate heat loss, but can prove to be an expensive approach. Homes can be identical in size and appearance yet one may be twice as expensive to heat as the other. Too, if you guess, and select equipment that is too large—just to be safe—you may not sell enough jobs to make electric heat a profitable endeavor. And if you guess too low, unhappy customers result.

Because heat loss estimation is so important to proper electric heat installations, our company called in the Perrygraf Corporation of Maywood, Ill., and explained what we wanted.

The Perrygraf organization specializes in producing slide-charts designed to accurately mechanize mathematical, sales and other problems. For detail work, such as is involved in calculating heat loss, it is our belief that a well-executed slide-chart is unexcelled.

We told Perrygraf of the need for rapid heat loss estimation among electric heat contractors and utilities, and that it was our desire to provide them with a simplified method of estimating heat loss.

Perrygraf, working closely with our engineering staff, came up with a slide chart that not only makes heat loss estimation simple, but also provides a means of estimating the cost of electric heat operation.

The Perrygraf-designed slide-chart, which we call an "Estimator," is but eight inches long and three inches wide and fits easily into a coat pocket. An inner panel slides back and forth similar to the slide in a slide rule. One side of the Estimator determines heat loss, the other heat cost.

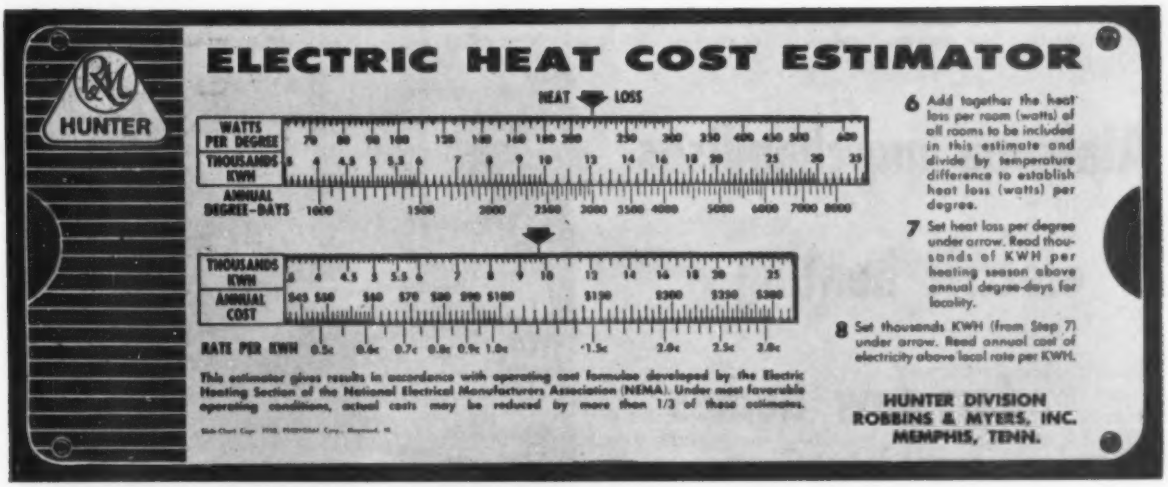
The Estimator actually consists of two parts, one the slide-chart proper and the other an 8½ by 9¼-inch chart printed on heavy paper stock which folds around the Estimator when not in use. The paper chart lists the outside design temperatures and winter degree days for 152 U. S. cities. It also points out the factors necessary in establishing a basis for evaluating the "degree of weatherproofing" in a residence or other type structure.

The Estimator gives results in accordance with operating cost formulae developed by the Electric Heating Section of the National Electrical Manufacturers Association (NEMA).

The slide-chart is based on eight to nine-foot ceilings. For higher ceilings, 8 per cent must be added for each foot above nine feet. The Estimator is not to be used for rooms whose ceilings exceed 12 feet.

To determine the degree of weatherproofing in a structure, it is simply necessary to add the positive factors of each room to the number 10 (which is the number of positive points for a single story house of normal frame or brick construction without insulation and with average windows) and subtract the negative factors. These factors and their individual numerical ratings are listed in the printed chart.

Weatherstripping of all windows and doors is worth one point. If attic insulation is one to two inches thick, two points are earned. But if attic insulation is three or more inches thick, three points are scored. All other positive factors such as floor and wall insulation and heated space above or below


ELECTRIC HEAT COST ESTIMATOR
HUNTER
HEAT LOSS
WATTS PER DEGREE
THOUSANDS KWH
ANNUAL DEGREE-DAYS
THOUSANDS KWH
ANNUAL COST
RATE PER KWH
6 Add together the heat loss per room (watts) of all rooms to be included in this estimate and divide by temperature difference to establish heat loss (watts) per degree.
7 Set heat loss per degree under arrow. Read thousands of KWH per heating season above annual degree-days for locality.
8 Set thousands KWH (from Step 7) under arrow. Read annual cost of electricity above local rate per KWH.
This estimator gives results in accordance with operating cost formulas developed by the Electric Heating Section of the National Electrical Manufacturers Association (NEMA). Under most favorable operating conditions, actual costs may be reduced by more than 1/3 of these estimates.
HUNTER DIVISION
ROBBINS & MYERS, INC.
MEMPHIS, TENN.

is valuable tool for contractor

the room are added to the base 10 to give the total of positive factors.

Next the negative factors are considered. Each of these rate from one to three points. Window walls, concrete block walls, concrete slab floor without edge insulation, etc., all earn various negative points. The total negative factors are then subtracted from the total positive factors. The figure obtained is then compared with those in the printed chart for immediate classification of how the room scores in degree of weatherproofing. These scores, as they appear in the paper chart, are listed below:

Total Points	Degree of Weatherproofing
12 or less	Poor
13 or 14	Fair
15 or 16	Good
17 or more	Full

Using the Estimator, the first step is to move the slide so that the square feet of floor area in the room you are measuring appears beneath the arrow. For a 12 by 15-foot room, you simply move the scale so that the figure "180" is under the arrow.

Immediately beneath the floor area figures in the Estimator is Factor "B," to be read above the degree of weatherproofing just determined. If the degree of weatherproofing in the 12 by 15-foot room has earned the "Full" rating, for example, the slide chart will instantly show that your Factor "B" is 78.

The next step entails adding the combined area (in square feet) of all windows and doors in the room to Factor "B." (When storm sash or double glazing are used, it is necessary to use only one-half the area of windows and doors).

Factor "B" and the figure obtained from computing the combined area of windows and doors are added together and their total (B + C) is then set in the middle window of the Estimator, under the number of exposed (outside) walls in the room. Let us say that the total window and door area in our sample room is 42 ft. 2.

If there are two exposed walls, the figure 120 (78 plus 42) is set under the numeral 2. The Estimator is now set to tell you heat loss for the room in either BTU's per hour or in watts.

To determine the heat loss of the 12 by 15-foot room, you of course must first know the temperature difference (desired indoor temperature minus the outside design temperature) for the city involved. The outside design temperatures for major U. S. cities and the temperature differences (based on 70° indoor temperature) are listed in the chart. In actual practice, this temperature difference is easily remembered by frequent use and it is not necessary to be constantly consulting the chart.

For purposes of illustration, let us assume the 12 by 15-foot room we are figuring for heat loss is in a home located in Macon, Ga. The temperature difference in Macon is 55.

On line 4 of the Estimator, the figures immediately above the numerals "55" indicate the amount of heat loss in BTU's per hour. The Estimator, in our illustration of the home in Macon, indicates that 6,600 BTU's per hour will be lost from the room at design temperature. The equivalent heat loss in watts, read on line 5, is 1930 watts.

The type and size of equipment for comfortably heating this room in a home in Macon can now be properly selected. It is necessary that each room of a structure be individually calculated for heat loss for the heating equipment needed may differ in capacity with each individual area.

If it is desired to learn the approximate annual cost of heating a home or building, the reverse side of the Estimator can be used for this purpose.

After determining the heat loss

(Continued on page 112)

Readers of ELECTRICAL SOUTH who wish to obtain an R&M Hunter Electric Heating Estimator described in the accompanying article should direct their request to James B. Gantt, Hunter Division, Robbins & Myers, Inc., P. O. Box 3775, Memphis 14, Tenn.

Alabama merchandises electric heating for new homes

C. Warren Cheatham, supervisor of residential heating and air conditioning at Alabama Power Co., addresses a conference on electric heating and heat pumps. He has guided the company's program since 1950.

By Wendell Givens

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Enginers

◆ A DEFINITE BREAKTHROUGH for heat pumps in the speculative homebuilders market and a gradually increasing tempo in electric heating installations are results of aggressive but controlled promotion by Alabama Power Company.

In June the company reported the 1000th heat pump had gone into operation on its lines. Seventy per cent are in residences.

By the end of this year Alabama Power officials estimate that between 2100 and 2200 electric heating installations will be in use.

C. Warren Cheatham, supervisor of residential heating and air conditioning, has been the pilot of the company's promotion program. His assistant is H. Nelson Eanes. Aggressive selling by residential sales engineers in the company's six geographical divisions and help from hundreds of fellow employees who talk the "live better electrically" theme have accounted for the rapid growth of heat pumps and electric heating installations.

Mr. Eanes foresees the speculative homebuilders market as perhaps the best selling source for heating pumps in the years ahead. "Heretofore, heat pump prices have been the main barrier in this field," he said. "Now that the manufacturers are coming out with smaller, less expensive units and better all-around equipment, the speculative homebuilders are finding that heat pumps are a strong selling point, even for low-priced homes."

Alabama Power plans to exploit the advantage. Outdoor advertising signs will point out that all homes in certain new developments will be equipped with heat pumps. Tie-in advertising in newspapers will help builders spread the word of all-electric homes.

Manufacturers' representatives and Alabama Power residential sales engineers attended a recent Birmingham conference on electric heating. Front row, left to right, are H. Nelson Eanes, heating and air conditioning engineer; J. P. Brown, residential sales manager; and C. Warren Cheatham, all of Alabama Power.

Alabama Power home service personnel will be on hand as hostesses in all-electric show homes.

The company also is tying in with Medallion Homes promotion, selling builders on the added prestige of such homes.

Aggressive selling, but still carefully planned and controlled has been the company's aim since it launched the program under Mr. Cheatham's guidance in 1950. Alabama Power seeks out and welcomes electric heating customers, but only when homes are properly constructed and insulated for it.

Most such installations are, of course, in new construction, but some are going into existing residences. In the latter cases, the company makes certain of adequate insulation and other such factors, before recommending electric heat. Such a policy helps to insure satisfied customers.

With a rate (1.4 cents per kilowatthour) much lower than the national average, Alabama Power has a strong selling point. And the company has a strong incentive itself, for despite the steady rise in electric heating, the summer load peak is still outdistancing the winter peak.

Alabama Power maintains contact with contractors through key personnel in each department, and invites them to industry conferences—such as a heat pump and electric heating conference held earlier this year. But Mr. Eanes is of the opinion that much more can be accomplished in the company-contractor relationship if the latter can be made to realize the advantages in electric heating.

The aforementioned heating conference, at which Mr. Cheatham presided, brought together manufacturers of heat pumps and electric heating units and Alabama Power sales engineers. Company officials explored all phases of their heat pump and electric heating program; manufacturer representatives discussed their products; then a roundtable was held by residential sales engineers and heating and air conditioning engineers.

Similar meetings on a smaller scale are held in the company's six divisions.

Some of the most impressive promotion of heating by Alabama Power has been through sales folders and testimonial brochures prepared under Mr. Cheatham's direction. The sales folders explain in non-technical terms how heat pumps operate.

The attractively illustrated brochures carry testimonials from satisfied owners of electrically-heated homes and businesses all around Alabama.

Newspaper advertisements throughout the year carry Alabama Power's message of the advantages of all-electric living.

Northwest Florida sets heat pump sales record

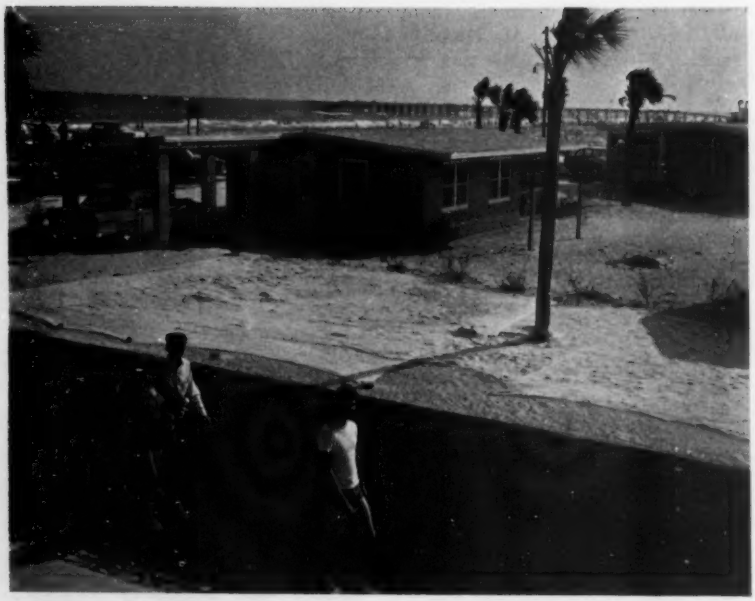
◆ DURING the past six months four times as many heat pumps were sold in Gulf Power Company territory as were sold during the past five years combined, reports Aubrey C. Goodwin, heating and air conditioning engineer. Two sizeable orders included 365 units for a housing development and 25 units for the first phase of a beach cottage remodeling program.

Approximately four years ago the Santa Rosa Island Authority built 55 fully equipped rental cottages at Pensacola Beach. Each of these is a home in itself designed and furnished as a home away from home for visitors at Pensacola Beach.

The Authority soon found that these homes were popular not only during the summer months but also in the winter months and in addition that visitors expected air conditioning and adequate heating as the season required. The cottages were originally equipped with small resistence electric heaters designed to take care of the limited use originally expected during the winter months, but this heating method proved to be inadequate due to the limited BTU output and inadequate air distribution.

After considerable study into the matter the Authority concluded that the best available heating and cooling system would be of the heat pump variety and a design

The demand for air-conditioning plus increasing winter trade were contributing factors in the installation of two-ton York heat pumps at the Northwest Florida resort.



Surf 'n Sand Cottages facing the Gulf of Mexico near Pensacola, Fla., were originally equipped with small resistance electric heaters.

was made for installation outside the building of two-ton York Heat Pump units with duct work carrying the air throughout the various rooms inside.

Realizing that the temperatures in the Pensacola area would some time fall below the point that could be handled by the reverse cycle system, supplementary heat coils were provided with a special thermostat control that will automatically bring these resistence heaters into action when the temperature falls below a specified point.

This cooling and heating system has been installed in 25 of these cottages on a trial basis. If the public response is good it is contemplated that the additional 30 cottages will also be similarly equipped in the very near future.

Weathertron Heat Pumps have been specified for 365 "Bronze Medallion" homes in Casablanca del Mar, a new suburban subdivision in Santa Rosa County, across the bay from the city of Pensacola.

Construction of the two, three and four-bedroom masonry homes, which will be priced from $15,000 to $18,000 complete, began in May. Approximately 150 units are expected to be built in the first year.

By agreeing to meet certain minimum standards of good lighting, wiring and electric appliances the builder will be eligible to receive from Gulf Power Company a Live Better Electrically Bronze Medallion for each completed home. In addition to 2½ ton heat pumps, the homes will be equipped with built-in electric ranges, quick-recovery electric water heaters, dishwashers, waste disposers and electric bathroom heaters.

Potomac Electric reviews space heating progress

◆ THE POTOMAC ELECTRIC Power Company has been cautious in approaching the electric heating market attests Vice-President Robert W. Wilson, Washington, D. C.

When radiant electric heaters were purchased by many consumers a few years ago, some for utilization as the prime source of heat, the company installed survey meters to study the electric heating load and its relation to other residential loads. The results were interesting and showed that the cost of installing electric heating equipment was frequently less than for conventional fuel fired equipment, and the operating cost was reasonable.

Since November 1957, there has been a serious effort, on the part of the company, to introduce the idea of greater utilization of electric energy for heating. It was an established fact then that many of our customers were pleased with the operation of their heating equipment and that the use of such equipment was on the increase.

Consequently, in November a small mail-out piece describing the electric heat pump and electric space heaters was enclosed in bills sent to over 300,000 customers. In May 1958, a second mail-out piece was prepared and sent to a selected list of architects, engineers, builders, financial people and others.

Additional inquiries were expected and a heat pump book of 23 pages was published to tell the interesting story of this "Two-In-One" appilance which cools in the summer and heats in the winter. Operating data and costs were included in this booklet for ten residential instalations and five commercial installations.

While this does not represent the total number of installations on the company's lines, it was felt that there was sufficient data to be of interest to those who inquired. These booklets were distributed to approximately 400 employees in company management in order that they might be informed. Over 200 have been distributed to consultants and customers who have inquired about electric heating.

The results have been very satisfactory and favorable. The response from this activity has introduced us to many customers who are planning a new residence or commercial building. As the response to the heat pump booklet has been good, a survey is now underway among customers using resistance heating equipment to determine their satisfaction so that a second booklet can be produced describing resistance heating installations. Among the electric heating customers on the company's lines, 50 are using resistance equipment and 65 are using the heat pump as the prime source of heat.

Whatever your customers want from higher output fluorescents...others are already getting...with G-E POWER GROOVES

THESE SATISFIED POWER GROOVE USERS EACH WANTED SOMETHING DIFFERENT . . . AND ARE GETTING IT!

SHAFER VALVE CO., MANSFIELD, OHIO

WHY POWER GROOVES? Because of improved color rendition and lower lamp replacement cost than mercury lamps.

JOHNSON-HILL'S DEPT. STORE, WISCONSIN RAPIDS, WIS.

WHY POWER GROOVES? To get more light (7½ times as much) from the same number of 40-watt lamps.

ERICKSON TOOL CO., CLEVELAND, OHIO

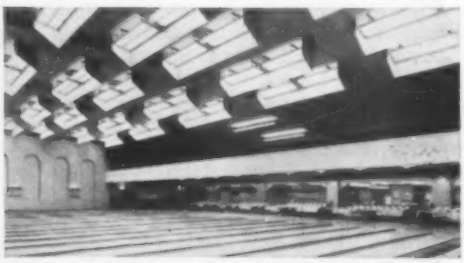
WHY POWER GROOVES? To get higher, more economical production lighting levels (160 footcandles), with no need for supplemental lighting.

GENERAL IRON & METAL CORP., CHICAGO, ILL.

WHY POWER GROOVES? To increase worker efficiency, speed-up production, reduce customer complaints.

CONVAIR, SAN DIEGO, CALIF.

WHY POWER GROOVES? To get the lowest operating cost compared to filament and mercury, and the highest level of light per watt.



PLA-MOR BOWLING ALLEYS, KANSAS CITY, MO.

WHY POWER GROOVES? To provide Pla-Mor lanes with a revolutionary, glare-free lighting system—superior to that in any other bowling center.

Don't *experiment* with your customers' lighting. Give them the newest fluorescent lighting that is endorsed by enthusiastic users all over the country. That *one*, of course, is the *tried-and-proved* General Electric Power Groove Lamp. Think of it! Almost twice the light of High Outputs—more than 2½ times the light output of slimlines! Power Groove users save up to 20% on initial cost, and keep maintenance at rock bottom at the same time. Call your local General Electric Large Lamp salesman right now and let him explain the whole Power Groove story to you. Or write: General Electric Co., Large Lamp Dept. C-839, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Tampa Electric promotes "Operation Heat Pump"

◆ ALL-OUT EFFORTS are being made by Tampa Electric Company to further the sale of heat pumps, reports G. D. Leach, Jr., heating and air conditioning engineer. Just about all methods of advertising and promotion are being utilized.

Heat pump installation signs, during house construction periods, have proven very popular with the contractors, both in Tampa and divisional towns, and result in quite a bit of plus-sales from people riding around on Sunday afternoons.

Some 10,000 colorful descriptive folders on heat pumps were given out at the 1958 Electrical Exposition, during open houses for model homes, and by home economists and heat pump contractors.

The Florida Electrical Exposition is one of the largest winter electrical expositions in the country and draws some quarter of a million people through its doors during the ten days it runs. The 50,000 square foot exposition building is conditioned throughout by heat pumps and was the mecca of the fair-goers this last frigid winter.

Operation Heat Pump—1958 is now under way to promote the sale of between 175 and 200 heat pumps during this three-month activity.

One of the outstanding contributions which the company has recently made to the air conditioning industry was started last October with the Air Conditioning Clinic, co-sponsored by Tampa Electric Company and Florida Power Corporation and conducted by the Trane Company.

This series of sessions, on all phases of air conditioning and heat pumps, extended through six months, with a total of thirteen meetings. The average attendence at each meeting was over 200, with very great enthusiasm from air conditioning contractors, consulting engineers and architects attending.

The company makes use of testimonial advertising in the builder sections of the local newspapers throughout the year. Contributing to their effectiveness has been the tie-in advertising by heat pump contractors.

Twenty 20-second spots on two television stations and a total of 165 radio spots on nine radio stations in Tampa Electric Company's service area are keyed to tie-in with large space newspaper ads during Operation Heat Pump.

A series of booster-up sheets is mailed to each of the seventeen heat pump contractors in the Tampa area, telling them about the large billboard advertising the utility company is doing to help their sales. The billboard ads take full advantage of national and local live better electrically campaigns.

Other forms of advertising and promotion include trade paper advertising, special manuals furnished to architects and contractors, heat pump demonstrations in Tampa Electric Company offices, direct mailings to residential and commercial heat pump prospects, and participation in special events.

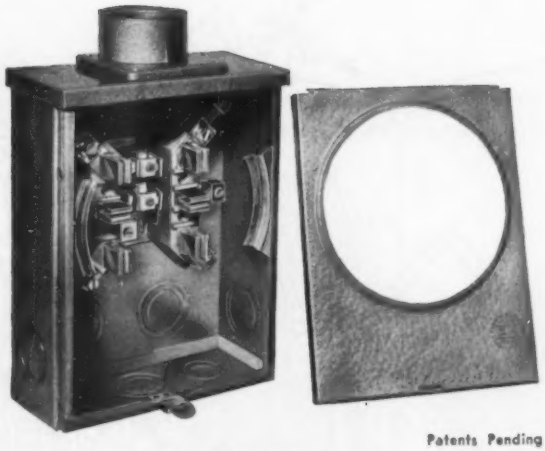
Space heating display tours for Potomac Edison

◆ PROMOTION UNDERWAY at Potomac Edison Electric Company is outlined by Commercial Marketing Manager J. P. Coblentz:

During the relatively short time which the company has been promoting electric space heating equipment, use has been made of a combination survey form and selling piece; an insulation requirements booklet; an education-type booklet for employee, architect, builder and prospective customer; hand-out pieces which include customer testimonials; and a leaflet promoting the Medalion Open House.

In addition, the utility's certified wiring program is closely tied-in with electric heating sales efforts.

An inter-urban bus is displaying electric home heating equipment in the Potomac Edison service area. Utility company personnel, architects, builders, bankers, etc., will have an opportunity to view an electric heat pump and various types of resistance heating equipment.



Patents Pending

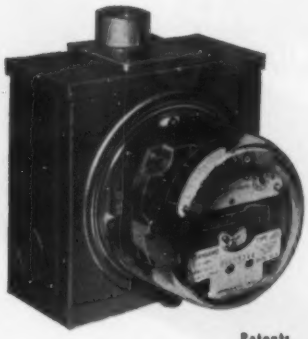
CATALOG-WVL-0175A-2"
SIZE 10½" x 8" x 3⅛"
175 Ampere Capacity
3-Gang Ground, 5th and 6th Terminals
Added Line Terminals for connection to other sockets

listen

. . . to what they are saying . . .

QUALITY WITHOUT QUESTION
REVOLUTIONARY – UNIQUE
FULLY TESTED & THOROUGHLY TRIED

ENGINEERED TO PROVIDE ALL THE ADVANTAGES YOU WANT AND NEED



Patents Pending

CATALOG-WV-011-A-1¼"
Size 8" x 8" x 3⅛"
Up to 100 Amp. Capacity

Positive corrosion protection . . . the complete enclosure is provided with a nonabsorptive oxide film after fabrication, then finished in a hard, durable, baked-on grey Hammertone Enamel . . . unexcelled performance!

B & C's

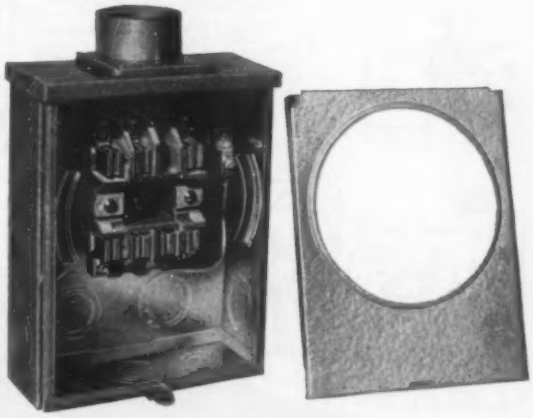
RINGLESS METER SOCKETS

. . . available in . . .

Light Duty
Medium Duty
Heavy Duty

Patents Pending

CATALOG WVL-0150A-2"
Size 10½" x 8" x 3⅛"
Up to 150 Amp. Capacity



Patents Pending

CATALOG WVL-1007-A-2"
Size 10½" x 8" x 3⅛"
7-Terminals — 100 Amp. Capacity

No Sealing Ring required! New Snap Latch sealing device. Interchangeable conduit hubs, and many additional flexible features. Stainless steel sealing latch and stainless rivets eliminates electrolytic deposits. Unique hinge terminals, pressure plate design, 4/0 capacity—straight-thru single or 3 gang terminals—5th and 6th terminals—semi-automatic visible by-pass—and many other features. . . .

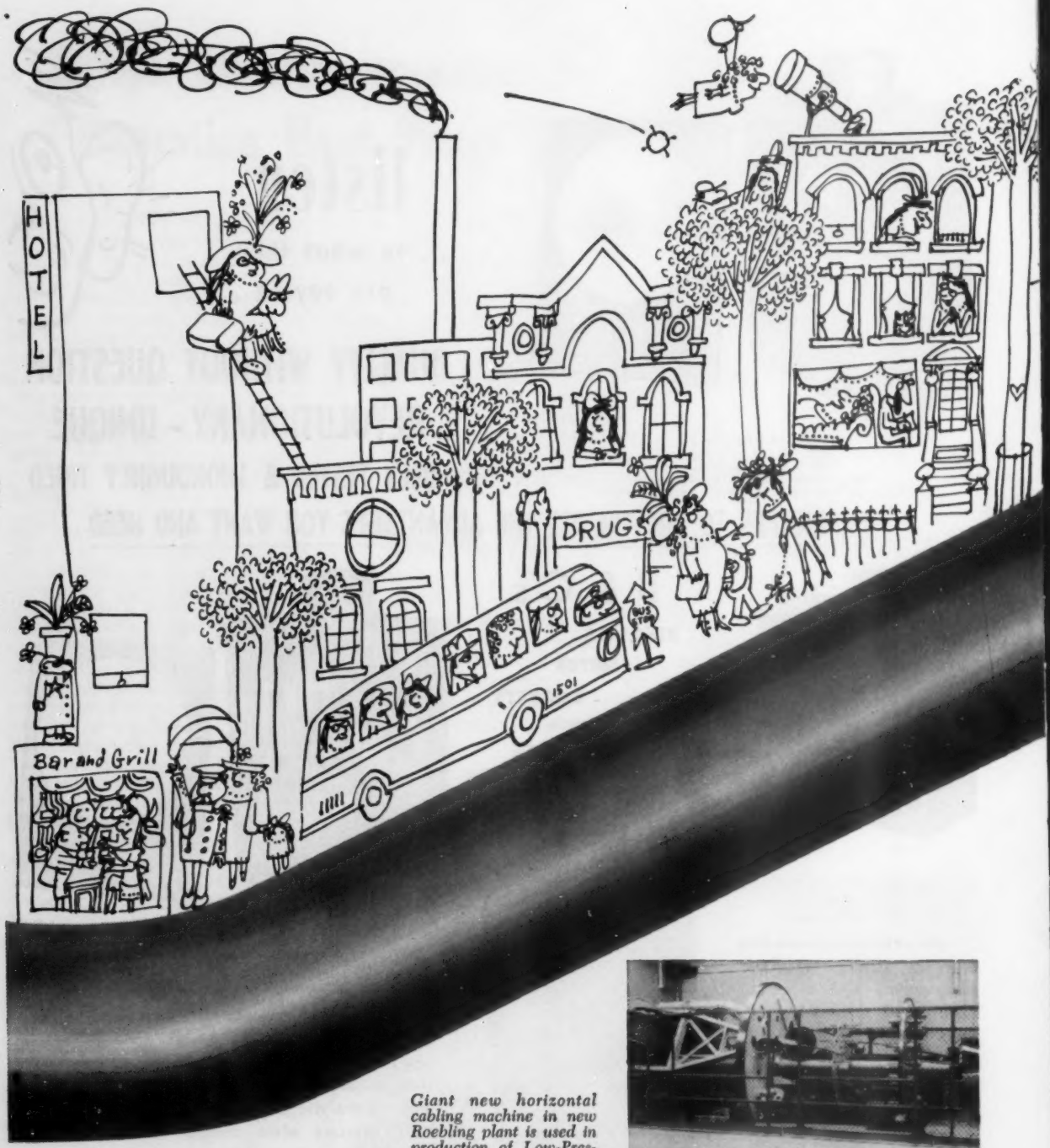
Write for descriptive catalog containing installation data and current price list.

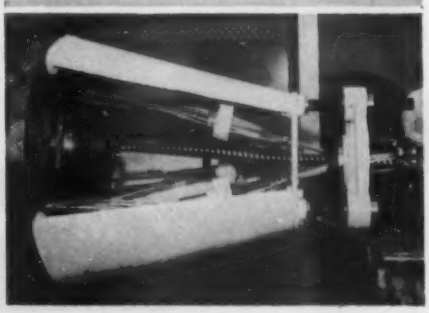
B and C

Your Seal of Dependability and Safety

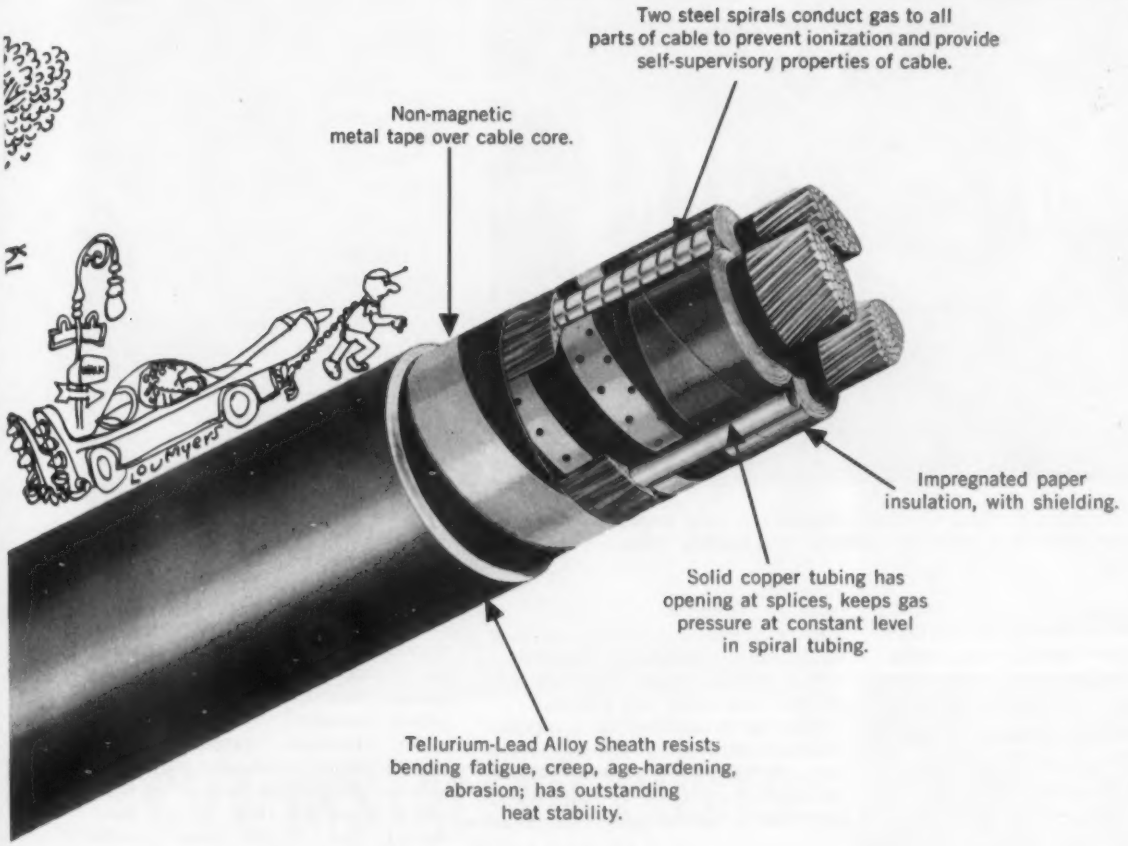
METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA





Giant new horizontal cabling machine in new Roebling plant is used in production of Low-Pressure Gas-Filled Cable. Here spirals, tube, insulated conductors and paper fillers are formed into cable.


Two steel spirals conduct gas to all parts of cable to prevent ionization and provide self-supervisory properties of cable.
Non-magnetic metal tape over cable core.
Impregnated paper insulation, with shielding.
Solid copper tubing has opening at splices, keeps gas pressure at constant level in spiral tubing.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.

FOR **UPHILL POWER** PROBLEMS **ROEBLING GAS-FILLED CABLE!**

Packs more power in less space than solid-type cable!

When power circuit profiles include steep grades, there's no better means of power transmission than *Roebling Low-Pressure Gas-Filled Cable!* Here's why. When a solid-type cable is used for an installation of this kind, its oil impregnant inevitably drains to the bottom of the grade. Result? At the top, the cable becomes vulnerable to ionization. And oil pressure build-up at the base of the grade rapidly causes a rupture in the lead sheath, resulting in cable failure.

Roebling Low-Pressure Gas-Filled Cable (for voltages up to 46 kv) ends both these problems . . . and has other benefits besides! Dry nitrogen gas, inside the cable at approximately 12 psi pressure, effectively suppresses ionization. From the top of the grade to the bottom, internal pressure is uniform.

Another major advantage of Roebling Gas-Filled Cable is that it is self-supervisory. An alarm system immediately tells you if there's trouble along the line. And because this cable carries more power in a smaller diameter, existing manholes and conduits do not have to be altered.

If you have had trouble making power cable behave on grades (or anywhere else), call your Roebling Field Representative *today* about Roebling Low-Pressure Gas-Filled Cable! And for an eye-opening brochure, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

Potomac Edison's "Heating Cruiser" displays a heat pump, baseboard units, fan operated wall units and panels, and ceiling cable.

A mobile display of the various types of space heating equipment is the utility's most recent endeavor. After successful tours as the "Commercial Cooking Cruiser" and the "Frigidaire Cruiser," an inter-urban bus was adapted for the display of a heat pump and various types of resistance heating equipment including baseboard units, ceiling cable and fan operated wall units and panels.

The bus is operated on a regular schedule throughout the four-state area served by Potomac Edison and is being toured by employees, architects, builders, bankers, etc.

Individually controlled room units cited as heat pump trend

◆ ELECTRIC UTILITIES were cautioned not to sit around and wait for the central heat pump air conditioner to build up winter power consumption, because the individual room heat pump, and not the central, will be their bread and butter.

The advice was given by Salvatore Giordano, president of the Fedders-Quigan Corp., Maspeth, N. Y. He spoke on the importance of room heat pumps before a group of electric utility executives at the 3rd Annual Electric Space Heating and Heat Pump Conference held recently at the Barbizon-Plaza Hotel, N. Y.

Mr. Giordano predicted that the room air conditioner industry will be selling one million heat pumps annually before the central units are moving 50,000 a year. "At that ratio," he said, "room heat pumps will require seven times more electric power than will central systems."

The Fedders executive called on the electric utility industry to help promote the room heat pump for its own good. He suggested that utilities should subsidize the heat pumps in their own areas by giving preferential rates to heat pump users, aiding in necessary rewiring, or stimulating dealers through bonus plans as they have done with other appliances.

The heat pump, a machine that provides both air conditioning in the summer and heating in the winter, has long been anticipated by the electric utility industry as its best hope of becoming competitive with other fuels for house heating. Also, because a majority of the electric utilities have their power peaks in the summer months —due primarily to air conditioning—they have been in the need of electric appliances that would be used in the winter, as well.

The success of the heat pump, however, will not be in the central, whole house systems, as the utility expects, according to Mr. Giordano, but rather in the individually controlled room units. "Just as the room air conditioner popularized air conditioning itself, so it will be that the room heat pump will popularize the heat pump concept."

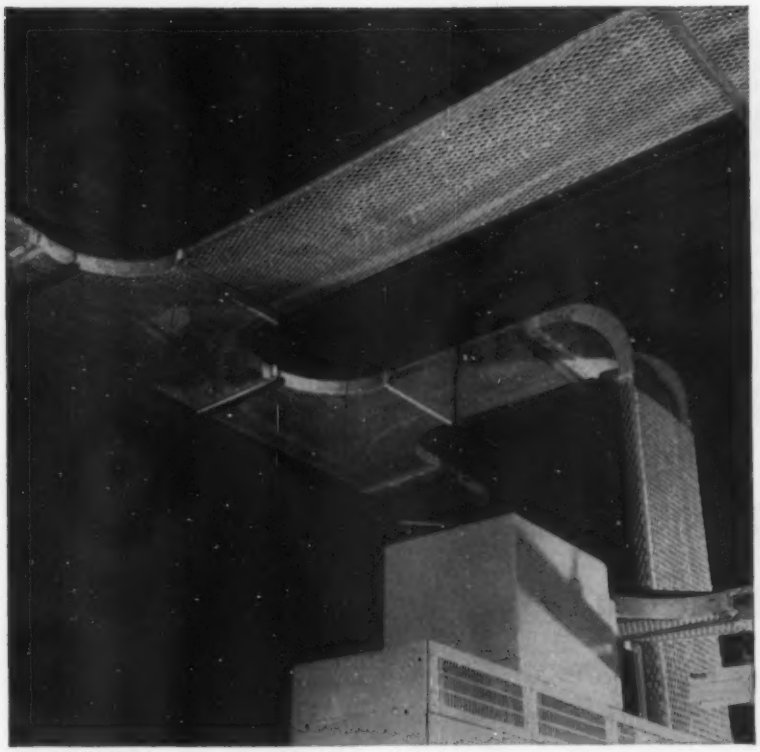
Mr. Giordano stated that the utility industry had been somewhat conservative in its forecast of heat pump sales for 1958. It had predicted that 13,500 heat pumps would be sold this year. "Fedders has already sold more than that in one month with its 1958 line—and we're not the only manufacturers in the business."

The executive also reported that while the heat pump was formerly a product used mainly in the warmer southern climates, 51 per cent of Fedders 1958 heat pump shipments have gone to areas above the Mason-Dixon line. He credited technical advances on the product itself for this shift.

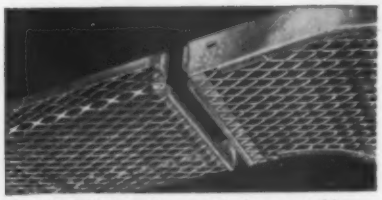
The most northerly region responding to a Fedders heat pump advertisement last December, said Mr. Giordano, was Alaska. "I didn't expect to be selling that far north!"

Virginia utility announces heating development plan

◆ AN INTERESTING heat pump dealer development program has been launched by Virginia Electric and Power Company. The utility will pay, to the dealer, a sum of $100 for each package heat



EASY FOUR-STEP ASSEMBLY



UNI-TRAY sections ready for assembly.

Side "Wedgit" channels inserted part way.

Bottom "Wedgit" channels inserted.

Side "Wedgit" driven easily into final position.

CUT INSTALLED COSTS OF CABLEWAYS

with this improved UNI-TRAY system

With DELTA-STAR's improved UNI-TRAY cableway systems you reduce installation time as much as 40%. Simply position the trays, then tap in "Wedgit" fittings to connect sections. No bolts, pins, or hinges to fit or tighten. UNI-TRAY joints are assembled four times faster than cableways with other types of fittings.

Strong, lightweight expanded metal sections provide the ventilation necessary for high current rating of cables, prevent collection of water and dirt. And continuous contact area of the "Wedgit" fittings provides an excellent contact for grounding.

Hot-dip galvanized steel or aluminum sections, with aluminum "Wedgit" fittings. A wide variety of shapes and sizes to meet your requirements.

USEFUL UNI-TRAY CATALOG • Ask your Delta-Star representative for this tell-all brochure, or write today direct to Dept. 35C, Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

pump, of 2½ tons or more in capacity, that is sold between March 15, 1958, and March 14, 1959, and installed, in accordance with the standards set forth in its regulations prior to October 1, 1959. This sum will be paid following the completion of each installation.

This program is being offered as an encouragement to heat pump dealers. The primary purpose is to attract and create the enthusiasm of economically sound and experienced air conditioning firms. It is, therefore, a program intended for regular franchised dealers only.

It specifically excludes the following sales categories: (1) Direct sales by distributors or manufacturers. (2) Sales through special or limited dealer franchises for but one or a few installations. (3) Sales for military housing, public housing, or other large scale government applications.

To qualify applicable heat pump installations it will be necessary only for the dealer to notify the Virginia Electric and Power Company, in writing, on two occasions: (1) At the time the sales contract is negotiated but prior to actual installation. (2) At the time of completion of each job.

Chattanooga reaches 12,330 customer kilowatt hours

◆ THE ANNUAL average kilowatt hours per customer for Chattanooga reached the figure 12,330 June 1st, 1958. This value has been achieved largely through the addition of electric heating and air-conditioning, relates C. Bert Osborne, sales manager for the Chattanooga Electric Power Board.

With saturation figures of 75 per cent for electric water heaters, 90 per cent for electric refrigerators, and 90 per cent for electric ranges, it is obvious that not much more can be done with these figures. Sales opportunities lie in the new houses containing electric heating connected to our lines.

For this reason, for about ten years we have promoted houses. For years we have promoted the all-electric home including electric heating, and in the last three years, air-conditioning. Newspaper advertising, radio and TV shows, billboards, painted bulletins, and window displays have all been used to further the sale of electric homes. As a result about 95 per cent of the new houses in Chattanooga have been all-electric. Over 40 per cent of the homes in Chattanooga, or 30,000, are electrically heated.

We figure that if we can get electric heat into the home, the rest of the appliances will come along naturally. Therefore, we try to get an adequate wiring installation and electric heat into the house.

While we have concentrated on new houses, we haven't been unaware of the conversion business. About 1000 old homes a year are converted to electric heat, and over 1000 public housing units have been converted to electric heat, in the last two years. Our kilowatt hour goal per customer is 21,500 kilowatt hours per year by 1965.

The commercial and industrial field is not being neglected either with over 400 very satisfactory installations.

Manufacturers contribute to CP&L sales promotion

◆ CAROLINA Power and Light Co., for the past year, has been actively engaged in promoting space heating for residential use both through heat pumps and resistance heating, relates H. B. Hicks, residential and rural sales manager.

To get the program underway, the company selected five key sales people and sent them to a one-week heating school in New York, sponsored by Ebasco Services. Following this meeting, these employees, along with members of the general sales staff, met and adopted a uniform presentation on house heating which was presented to all company employees through small group meetings.

Electrical heating manufacturers are appearing regularly at monthly divisional sales conferences to broaden general knowledge of the type and kind of heating equipment available. Representatives from the insulation industry appear at sales meetings to increase the understanding of techniques involved in full house insulation.

The most potent sales tool thus far used is a house heating brochure which was prepared for each division. This brochure is made up of the photographs of actual house heating installations, giving operating data, testimonials, and other pertinent information.

In this short period of time, the company has been most happy with the results attained. Now in operation in residences on the CP&L system are 148 heat pumps and 127 resistance heating jobs. It is believed these figures will be doubled by the end of 1958.

At the moment, system peak occurs in the winter time. There is approximately six per cent spread between winter and summer peaks. One of the reasons the extreme summer peaks of some other companies has not been experienced is the range saturation of 72 per cent and the water heater saturation of 61 per cent.

The company's most active competition focuses its principal sales effort at house heating hoping at a later time to get a larger share of the cooking and water heating market. Carolina Power and Light Company is interested in preserving these loads.

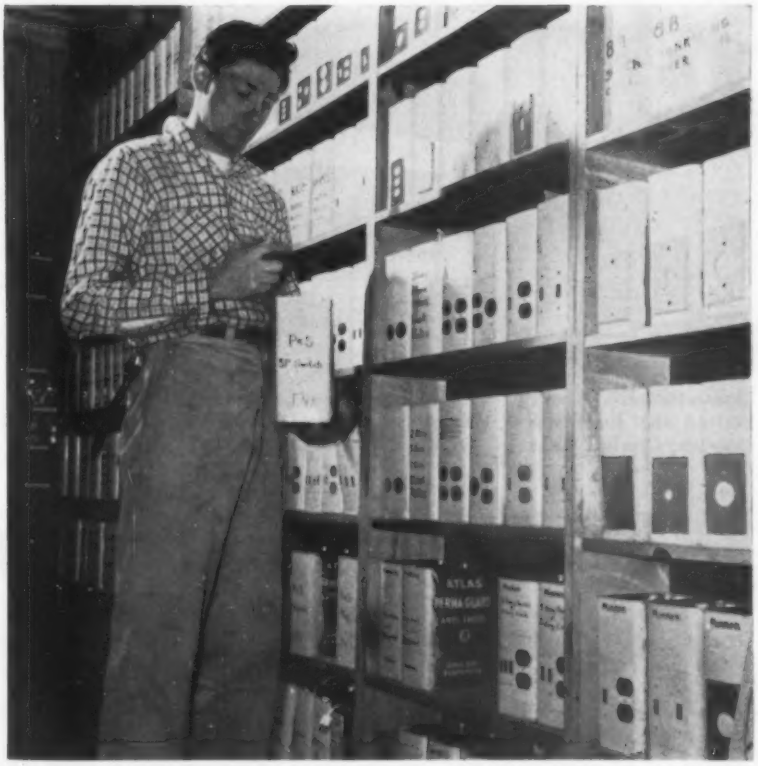
Sixty-four heat pumps and 954 kw of space heating were sold in the recently concluded "Springmaker" campaign conducted by CP&L's commercial sales section, reported William P. McPherson, commercial sales manager. "While this campaign was a success by most any yardstick that you desire to apply, no doubt the greatest benefit will come from the interest that has been created in the use of heat pumps and electric space heating throughout the entire territory served by our company."

Contractor's training course designed for all employees

By Randolph W. Reed, Jr.
Electrical Contractor
Washington, D. C.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers



Electrical parts and supplies are readily accessible under the storage system devised by Randolph W. Reed, Jr. A comprehensive course of instruction each week throughout the year keeps employees from the apprentice to the veteran journeyman posted on new developments in the industry as well as routine procedures of company operation.

◆ DOING a specialized type of electrical work—repairs, heavy-ups and installations in existing buildings—we like to train the mechanics we take on in our way of doing things.

Job orientation

Some may have come to us with experience in new construction; some may have specialized in a particular branch of electrical work.

We may have on our staff apprentices preparing for the licensing examination, and even among our older employees those who appreciate refresher courses in our methods and procedures, and who wish to be kept abreast of new developments, new items, new features in the electrical industry. Furthermore, there are developments affecting their daily work about which they should know, but for which there is little time to investigate in the course of each day.

It is for such a variety of needs that we have introduced a two-hour evening class weekly that is run throughout the year. Everyone attends, usually 15 to 18 of us, first having dinner together at a nearby restaurant and then following it up with one hour of problem discussion and a second hour on questions, reviews and individual needs.

Varied topics discussed

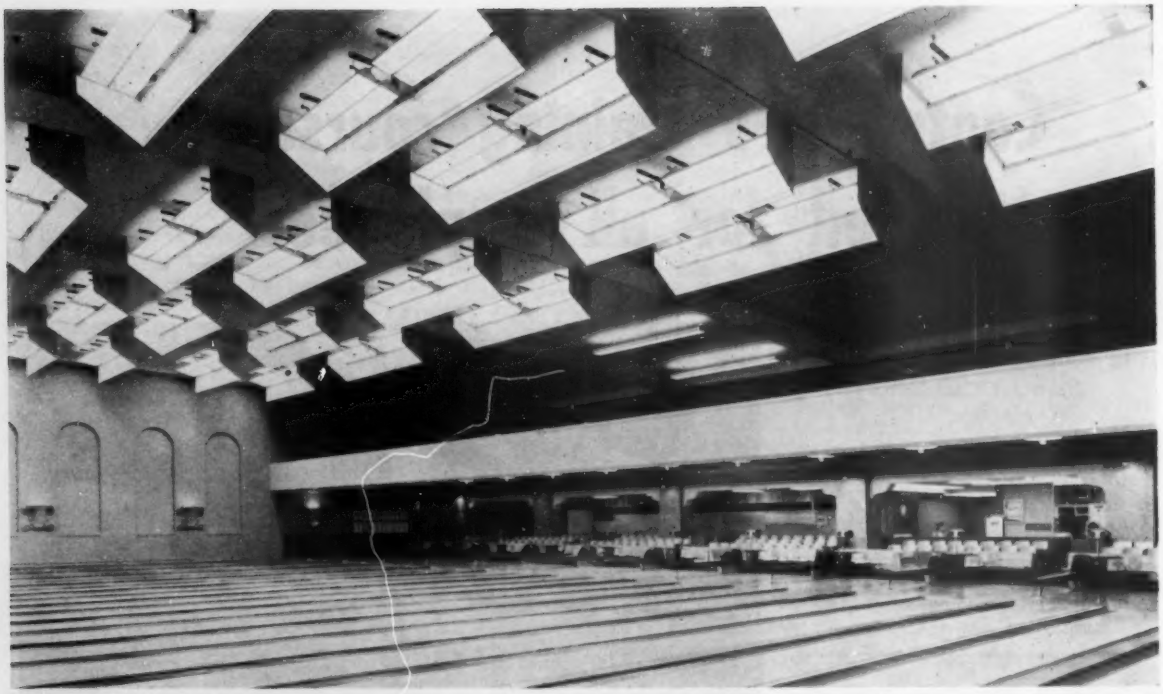
Such topics as How to Take Care of a Truck (the withdrawal, recording and replenishing of items), How to Fill out Tickets, How to Approach a Customer's Home, How to Talk to a Customer, Method of Wiring a New Item on the Market, How to Use Tools, Tools for Every Mechanic's Kit, etc..

We have had a speaker on insurance discuss with our staff how a mechanic is to handle himself in the event of an accident. We have made a complete layout of essential tools, taken a picture of them and posted the picture on the wall. Mechanics new with us or apprentices just building up their tool kits may buy from us at cost the tools they need, paying a small amount of their wages weekly.

We have had our office manager give instruction in the preparation of forms, explain how items on a form are posted and recorded, so that mechanics know why it is important to record time and materials accurately as we wish it done.

We have had a one-hour discussion on heating controls, for example. I have given instruction in wiring methods, and with drawings on a blackboard, explained such things as getting a plug in a baseboard. I have taken the floor plans of houses and laid out the wiring from the floor plan.

(Continued on page 110)



Boese-Hilburn Electric Company designed and installed the fluorescent lighting system at Pla-Mor Bowling Center, Kansas City, Mo. Two Power-Groove lamps housed in each of 100 fixtures produce 100 footcandles of illumination for league bowling and 200 footcandles for weekly televised tournament bowling.

High-level lighting system installed in bowling center

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ THE POWER-GROOVE lighting system installed at the Pla-Mor Bowling Center, in Kansas City, Mo., holds promise of a new area of opportunity for electrical contractors and lighting engineers. This is indicated by the enthusiastic response of the alley management, the bowling public and the cream of the nation's professional bowlers.

Bowling proprietors, until now, have been comparatively indifferent to the amount of light they put on alleys. They apparently have been satisfied to provide enough light to let the bowler see the alley and have depended on a heavy concentration of light directly on the pins to give the bowler his aiming point.

Should anyone be skeptical about the size of the bowling alley business, a few figures might help. According to the Statistical Abstract of the U. S. Department of Commerce, there were 5,062 bowling establishments in the United States in 1954. Figures released by manufacturers of bowling equipment indicate that more than 500 a year have been built since then.

Last year, 625 bowling centers were built, each at an average cost of slightly over $1,000,000. One-third of the cost goes into non-bowling facilities, of which lighting is a major item.

The total Pla-Mor lighting installation for all lanes cost $100,000, with $12-$14,000 going into the Power-Groove part of the system.

What's more, each one of the existing bowling centers is a prime customer for a re-lighting job and the new ones going up are getting more sophisticated every year. The big play is for the family trade, which includes the lady of the house. Bowling proprietors have realized that in order to keep their lanes busy all day, they must make their places of business attractive.

Lighting engineers estimate that 25 footcandles is about the average level of illumination on bowling alleys across the country. At Pla-Mor, the management provides 100 footcandles regularly for league bowling and 200 footcandles directly on the lanes for professional tournament and TV bowling.

Mr. Is Vile, vice-president of Pla-Mor, attributes much of the success of his new lanes, which he appropriately calls "Sky Lanes," to the high-level lighting system.

"This new lighting installation,"

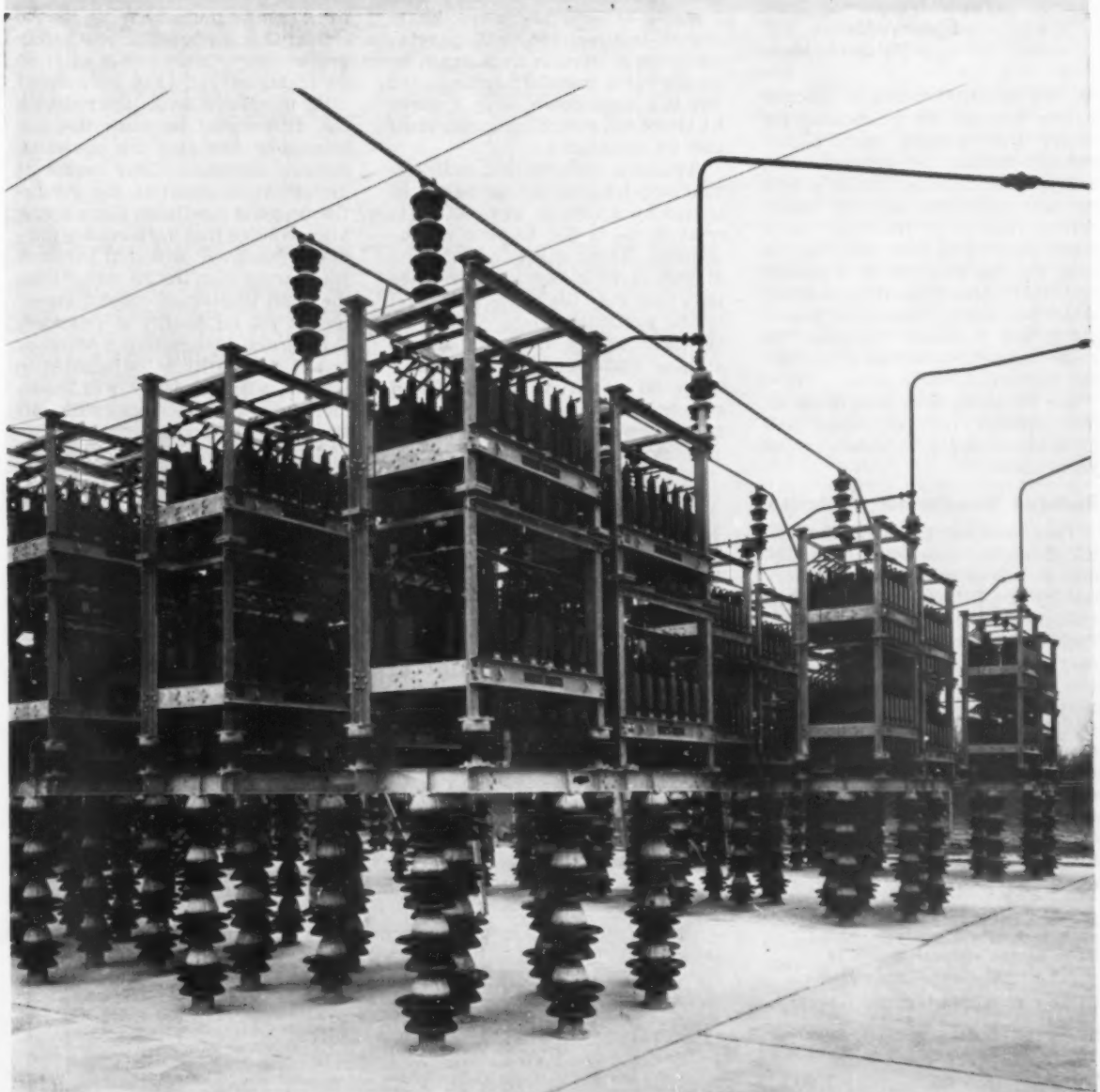
(Continued on page 110)

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance



This series capacitor has increased the load capacity of a key transmission line by 50 per cent. The unit is rated 57,600 kilovars, at 115/161 kv, and is installed in the Bogalusa Substation of Louisiana Power and Light Co., 50 miles north of New Orleans. **(See pg. 60)**

Six new developments in power transformers

By H. J. Mason

Power Transformer Dept.
General Electric Co.
Pittsfield, Mass.

◆ THE INCREASING USE of electric power has caused a demand for larger transformers with higher voltage ratings and greater reliability. Each demand brings a host of new problems for the transformer designer. He must pack more capacity in units that may be near the shipping limits of weight and size; he must learn more about dielectric fields, insulating materials, and transient voltages; he must make transformers quieter for use in residential areas.

Six advances have been made by the author's company that will have increasing significance in the years ahead:

Reduced transformer insulation

Two years ago the General Electric Company pioneered a reduction in power transformer insulation by two BIL steps in the higher voltage classes (138 kv and up). This was done following a five-year study of transformer insulation problems and lightning arrester development, and the accumulation of approximately five years' successful operating experience on 12 large power transformers for 138 kv and 230 kv systems which were built with insulation reduced two classes. Some of the advantages of reduced insulation are shown in Table I.

Table I

Effect of reduced installation on the characteristics of a power transformer rated:

FOA-T-60-200000-161000GrY-13200

BIL	Relative Weight	Relative Impedance
750 kv	1.00	1.00
650 kv	0.90	0.94
550 kv	0.85	0.88

*Registered Trade Mark, General Electric Co.

The Thyrite* Magne-valve station-type lightning arrester, with a rating of 75% of the maximum line-to-line voltage, will provide adequate protection from lightning surges for a transformer insulated two BIL steps down. (Fig. 1, curve b) However, switching surges must also be considered.

Available information indicates that switching surges can be represented by a voltage wave rising to crest value in 500 to 3000 microseconds. Tests made on Thyrite Magne-valve station arresters have indicated that the protective level in the switching surge region can be taken as the maximum of the arrester's 60-cycle crest sparkover. Tests on a variety of insulation structures have indicated that the transformer switching surge strength is at least 1.3 times the crest of the low frequency test. On the basis of these facts, it can be shown that the arrester will safely protect the transformer from switching surges. (Fig. 1, curve a)

As insulation levels are reduced, the differential between the low frequency test and the operating voltage decreases. This makes it important to maintain the insulation in good condition. Since large, high-voltage transformers are normally insulated such that the limiting stress is on the oil rather than the solid insulation, careful attention to the oil quality is indicated.

In order to determine whether or not oil quality is maintained in service, a field survey was made, including transformers with all types of oil preservation equip-

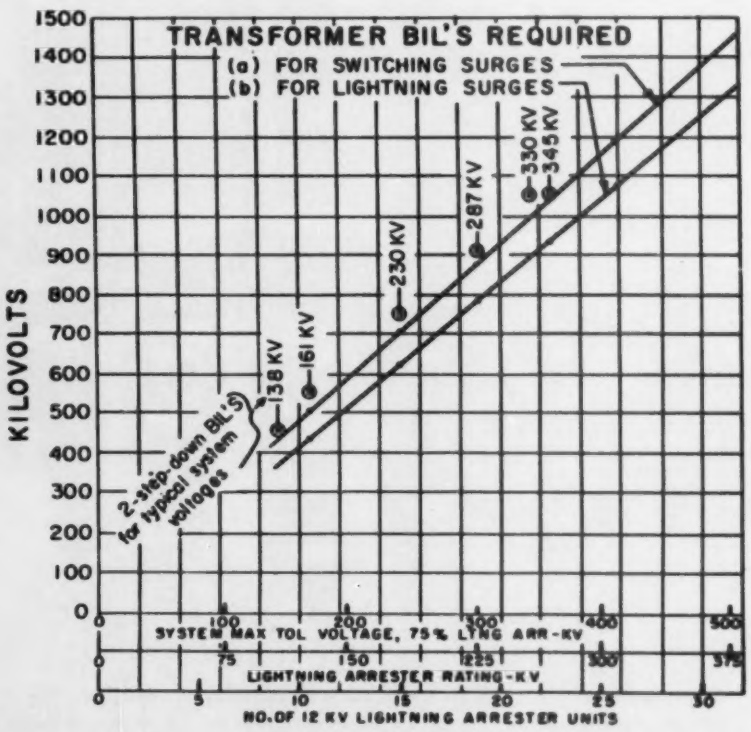


Fig. 1—Insulation coordination curves showing adequacy of two-step reduced insulation.

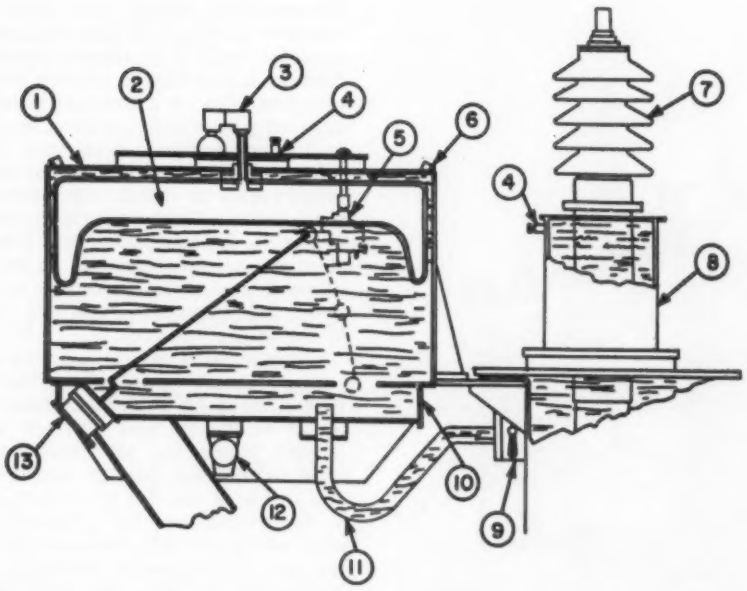


Fig. 2—Atmoseal oil preservation system showing relative location of parts: (1) oil reservoir, (2) air cell, (3) air cell ventilating breather, (4) vent valves, (5) automatic pressure-vacuum relief valve, (6) lifting lug, (7) transformer bushing, (8) bushing adapter, (9) shut-off valve, (10) sump chamber, (11) U-bend thermal seal connection pipe, (12) globe valve, 1-inch, (fill-drain filter), (13) liquid-level gage (with low level alarm contacts).

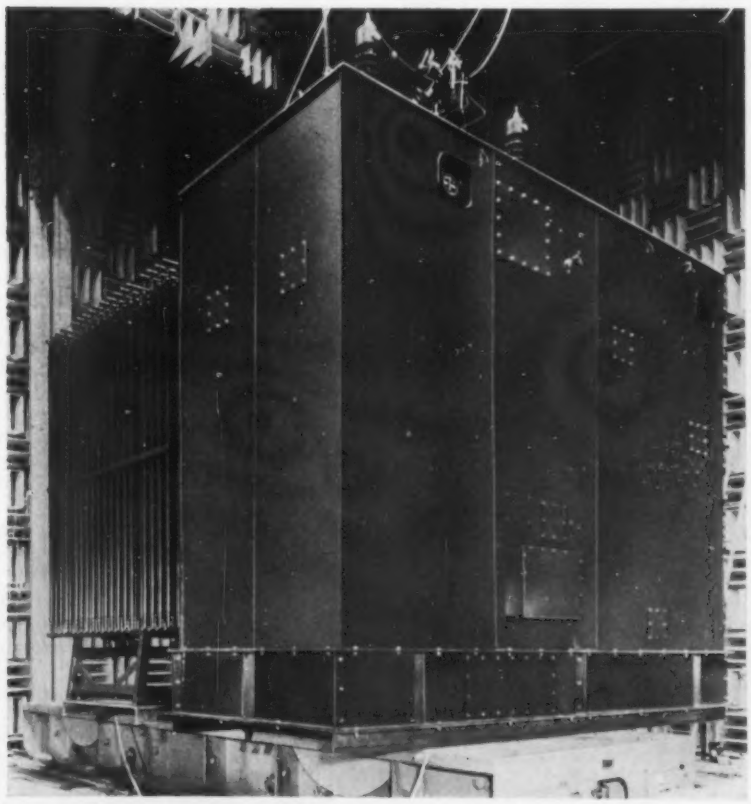


Fig. 3—Power transformer with prefabricated sound enclosure.

ment. The oil strength was found generally to be as high as at the factory. Hence, reduction in transformer insulation need not be delayed because of concern for basic oil quality in the field. A reduction of two BIL steps has already been accepted by 33% of the transformer users in this country.

Gas evolution

In addition to the basic oil quality, the effect of gas evolution in the oil of nitrogen-gas-cushion and completely sealed transformers must be considered.

When degassed oil is exposed to nitrogen at atmospheric pressure and 25°C, the oil will gradually absorb the gas until equilibrium is reached with approximately 8.6% of nitrogen by volume in solution. The amount of nitrogen dissolved increases with both temperature and pressure, but the pressure effect predominates. In a nitrogen-gas-cushion transformer with a maximum pressure of 7½ psi, the amount of gas dissolved may reach 12% to 14% when operating at or near full load for a sufficient length of time to attain equilibrium.

As long as the maximum gas pressure is applied to the oil surface, the gas remains in solution and is no problem. However, if the transformer is de-energized or operated at light load, the oil cools down, contracts, and the gas pressure is reduced. If the cooling occurs over a period of only a few hours, the excess gas cannot escape rapidly enough through the oil surface and a supersaturated condition results.

Under this condition any phenomenon which disturbs the oil will cause the evolution of bubbles and the rapid escape of the gas. In a transformer the shock of a through short-circuit, the oil movement caused by free convection, the oil motion induced by strong electric fields, and the agitation produced by oil pumps may trigger bubble formation.

That bubbles in the oil are a hazard comparable with moisture and other contaminants became apparent in the 1930's, as the result of experience with impulse testing. It was found that air in the insulation structure was a major cause of failures. Vacuum filling is necessary to eliminate the problem. Recent tests have shown that profuse gas bubbling can reduce the oil-strength 50%.

Since such serious impairment of oil strength is an undesirable serv-

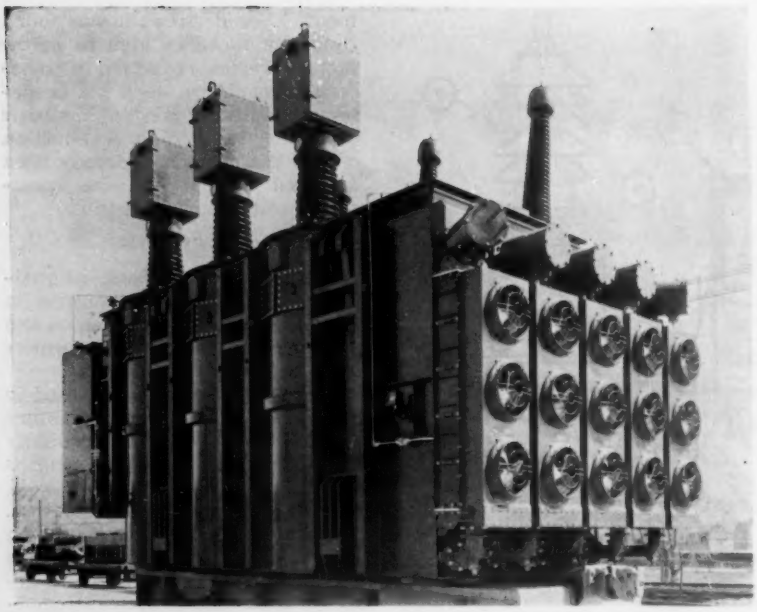


Fig. 4—125,000 kva (output) power autotransformer rated 230 kv to 120 kv to 13.2 kv.

Fig. 5—40,000 kva transformer with Atmoseal oil preservation system.

ice condition, studies were undertaken to eliminate it. Limiting the pressure range in gas-sealed transformers is one way to achieve this objective. Use of a constant pressure oil preservation system, such as the conservator, is another. A new and improved method of oil preservation is called the Atmoseal* system. This system is shown in Figure 2. It combines the constant pressure feature with an impermeable isolating diaphragm between the atmosphere and the oil in the expansion tank.

The Atmoseal system employs a cell of inert synthetic rubber strengthened by a synthetic fabric to act as the air seal. The cell is located inside the oil expansion tank, separating the air and oil. The inside of the cell is connected to the atmosphere by a breather pipe, while the space between the cell and the expansion tank is occupied by oil. The cell literally floats on the oil; as oil flows into the expansion tank, the cell air space diminishes and the cell floats at a higher level.

The Atmoseal cell combines the totally sealed feature of the inert gas seal system with the constant pressure, low maintenance features of the conservator. In addition, its low height minimizes interference with overhead lines and prevents loss of oil if the top porcelain of a bushing should be fractured accidentally. Figure 5 is a photograph of a transformer equipped with the Atmoseal device.

Transformer audible noise

The trend toward installing large distribution substations closer to the point of energy consumption, and the general growth of residential building into outlying areas where substations were formerly located, has caused transformer noise to become a matter of concern to many utilities. In some instances it has been necessary to attain sound levels considerably lower than those established by the NEMA Standards.

Two general approaches have been made to the problem of lowering sound level:

a. Reduce the generation of sound by designing the transformer with lower magnetic induction in the core. This less efficient utilization of material results in a larger, heavier, and more expensive unit.

*General Electric trademark for a constant pressure oil preservation system.

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Atlanta, Georgia

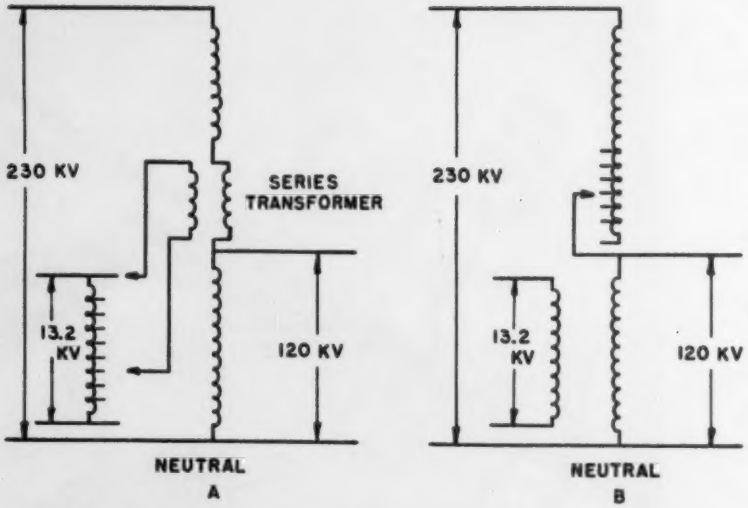

Fig. 6—Load tap changing circuits utilized in power transformers.

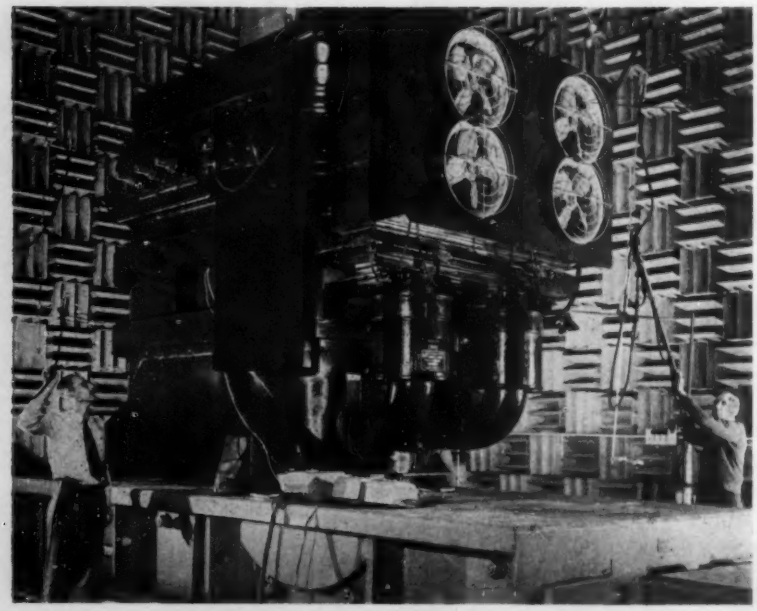

Fig. 7—2,000 kva gas insulated transformer undergoing sound tests.

b. Attenuate the generated sound by constructing a building around the transformer, or erecting walls, usually on three sides.

A new approach to the problem is to prefabricate a sound enclosure which is coordinated with the transformer design. This method permits the use of normal magnetic induction in the transformer core with the attendant minimum weight and size. It also offers savings in cost, space requirements, and installation effort.

In the prefabricated sound enclosure, the core and coils are of conventional construction, but the tank is encased in a steel enclosure, and the cooling tubes are mounted in a separate bank. Both tank and enclosure are mounted on a common concrete pad, but resilient tank mounts serve as a means of vibration isolation. All items passing through the enclosure, such as cover bushings, pressure relief device, and cooling tube connections, are isolated by resilient seals.

The steel, weatherproof enclosure can be of one-piece construction with auxiliary devices accessible through hinged doors or handholes. Glass windows are located in front of dial-type instruments. Overall sound reductions of from 15 to 20 db may be obtained.

A prototype design has been completed for a prefabricated enclosure which can be shipped in place. This design was built around a transformer rated self-cooled, three-phase, 10000 kva, 69000 volts to 15000 volts with load - tap - changing equipment. Figure 3 is a photograph of the transformer.

The author's company now has 15 transformers with prefabricated sound enclosures on order, ranging from 20000 to 70000 kva. This design can be furnished for any application requiring sound level reductions of the above-mentioned magnitude.

Use of digital computers

An IBM Card Programmed Calculator was used for power transformer design work by the author's company from April 1953 until February 1957, when it was replaced by the much larger and faster IBM 705. By offering the advantages listed below, the digital computer has made it possible to extend standardization into areas previously considered too specialized; attendant product improvements have been achieved.

a. Flexible electrical design
b. Optimization of design
c. Improved accuracy
d. Time saving

Effective and dynamic standardization involves all the listed items. This can be illustrated, and the various items explained, by a discussion of the new Preferred Design line of power transformers. This line covers the range from 5000 to 50000 kva, 60 kv through 138 kv, with and without load-tap-changing equipment.

Preferred Design (PD) transformers have an external mechanical design which reflects the preference of the majority of the users. The bushing positions, accessory locations, arrangement of cooling equipment, and other mechanical features are fixed (with certain options) across a range of ratings. The family resemblance thus obtained is of real assistance to the user in substation planning, in installation, in operation, and in maintenance.

Although fixed mechanical design is a benefit to the user, **flexible electrical design** best suits his needs. This flexibility is offered in PD transformers, and is made possible by the computer. The flexibility includes not only many items specified by the user, such as kva,

(Continued on page 113)

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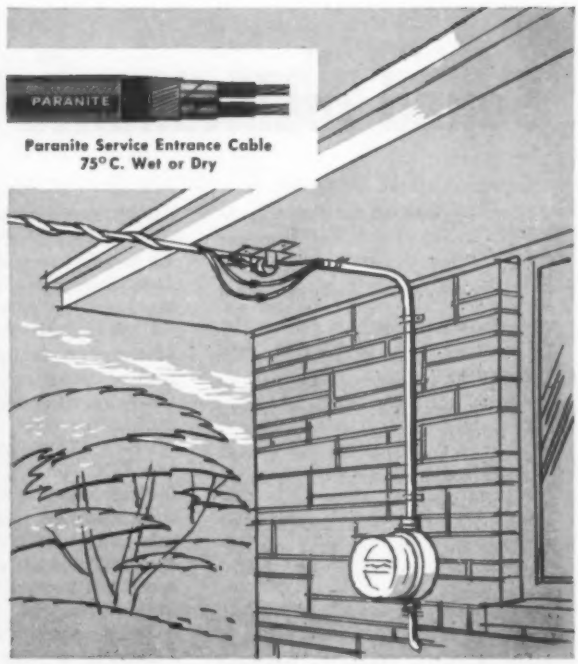

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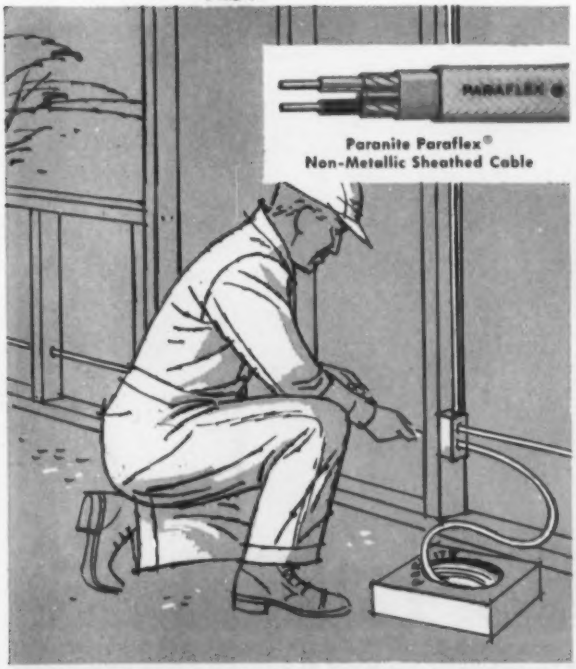

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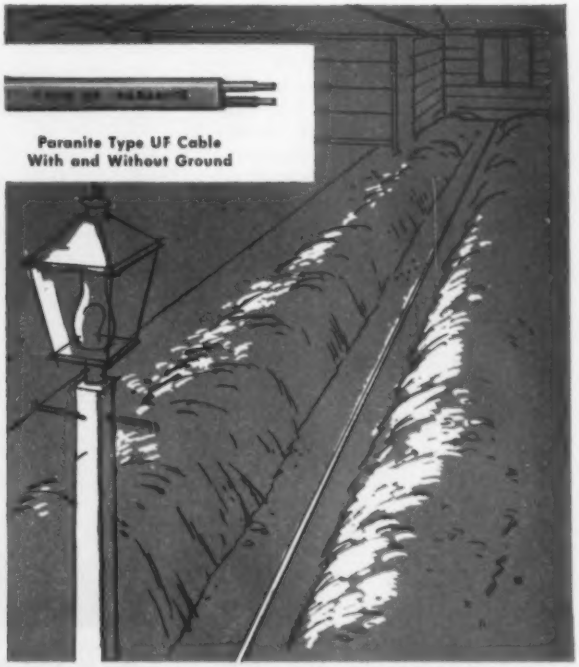

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Sound maintenance and operation insure

By George D. Pollock, Jr.
Chief Engineer

and W. L. Crafton
Meter Superintendent

Arkansas-Missouri Power Co.
Blytheville, Ark.

A TWO-WAY radio system can be only as successful as its user makes it. No matter how well the equipment itself and the system is designed and manufactured, a two-way radio communications network will serve a power utility, or any other business for that matter, only if it is maintained and operated properly.

Being in our tenth year of Motorola radio operation, we at Arkansas-Missouri Power Company have found that to insure good service and best value in everyday use and emergencies from our radio investment, two factors are of utmost importance.

The equipment must be kept in first-class operating condition, holding intact all the reserve power and sensitivity built into it by the manufacturer (in our case, Motorola). This is done through periodic preventive and thorough emergency maintenance.

Secondly, of equally vital importance is the formation of sound, clean operation procedures and methods; and then every day operation in full accordance with these set procedures. This enables our people to use radio in every possible way within the limits set by the Federal Communications Commission.

At Arkansas-Missouri, the two-way radio system is as wide spread as the company itself. All told, we have 122 mobile radiophone units, 23 base stations and 13 "Handi-Talkie" portable units for a total of 158 radio stations of all classes.

Two frequencies in use

Arkansas-Missouri's territory is roughly divided into two sections. Ironton, in southern Missouri, is the center of the one section, while the larger area covers the Boot Heel of Missouri and all of northeast Arkansas.

The 16 base stations operating in the Arkansas district and their associated 90 mobile units operate on a frequency of 158.25 in the power utility radio service. The Missouri district has five base stations and 13 mobile units that operate on a frequency of 153.71 in the same service.

The reason for the two frequencies is that our initial radio installations were confined to the Arkansas area at which time we were authorized the 158.25 MC. frequency. When we later applied to the FCC for a license for systems in the Missouri district, we found that another utility in the same area had already been authorized the 158.25 MC. channel. We then were authorized the second channel.

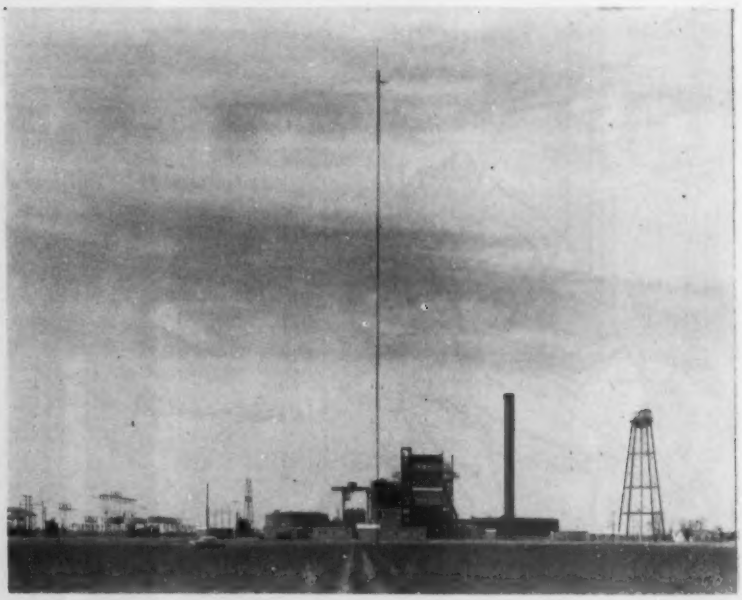
In operation, this dual frequency has no ill effects whatsoever since the two districts are quite independent of each other. The only times a hardship is provoked is during extreme emergencies, such as ice storms when the vehicles of one district are called into the other region. In that case we equip as many of these reenforcing vehicles as possible with the spare radio units of the correct frequency.

You have probably noted that the total base stations and mobile units listed for the two power districts do not equal to sum total originally mentioned. The discrepancy enters in the form of the Associated Natural Gas Co., a wholly owned natural gas distributing subsidiary, that operates two radio base stations and 13 mobile units.

Arkansas-Missouri Power Company and Associated Natural Gas Company transmits and distributes natural gas in 20 towns in Southeast Missouri and 13 towns in Northeast Arkansas. Our radio communications system is used in both our gas and electric operations.

Station power needed

Two of the base stations contain high powered 250 watt transmitters. One of these is at the Jim Hill steam generating plant near Campbell, Mo., one of our main power sources, and the other at Walnut Ridge, Ark., a main switching center about 53 miles from Jim Hill. The reason for the high powered transmitters in these locations is that through use of directional corner reflector antennas with a total



A 200 ft. steel tower dominates the scene at Jim Hill Plant, maintaining constant communication with a main switching center 53 miles away.

top performance from 2-way radio system

gain of 15 DB, we can maintain good communications between the two vital centers in times of emergency.

This point-to-point communications is not allowable and is not used for routine affairs, but in emergencies such as loss of private wire line and commercial communications it is permissible. Communications between the two centers must be maintained at all times.

The other base stations are smaller units, putting out 25, 50 and 60 watts. In recent years we have turned to increasingly greater use of the 25 watt A-C utility units as base stations in our smaller services offices. We find that the units do a fine job, and when equipped with 75 feet of antenna height, can cover 15 to 20 miles which is just what we need for local dispatching.

Our original equipment was purchased in late 1948 and installed in 1949. We started with five base stations including the main base at Jim Hill plant, and 16 mobile units. All of this equipment is still in daily use. This means ten years of solid service. Since we figure that a unit pays for itself within two to three years, you can see there's quite a few years of investment-free service. There is no doubt that the quality of the equipment has a great deal to do with its long lasting characteristics. However, we feel that our maintenance techniques also play a great part in keeping the equipment in first-class condition.

Service policy followed

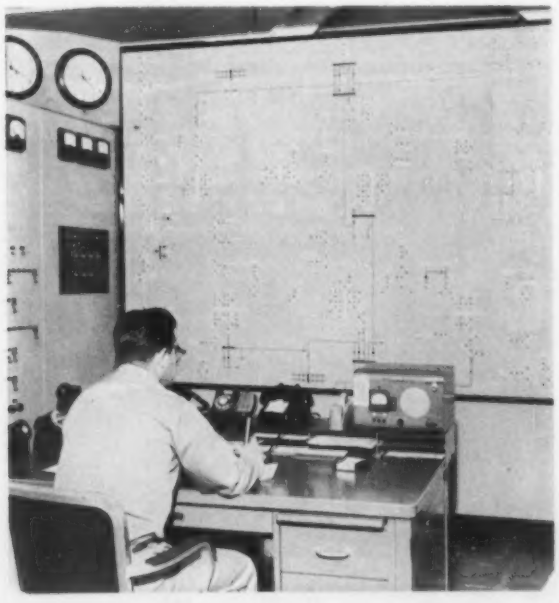
Our general service policy has always been to abide by the manufacturer's specifications. Our two technicians, W. A. Angel and James T. Peterson, give each unit a thorough preventive servicing every time the set is frequency checked as prescribed in FCC regulations. In addition, the technicians give preventive treatment to a few sets every time they are called into a certain area on an emergency service call. In this way, each unit is serviced several times a year.

One hard and fast rule followed by Angel and Peterson is to avoid indiscriminate tube changing. No tube is ever pulled on a hunch basis. It has to check out bad on the tube tester or be proved bad by malfunction or below par performance of the radio. Some of the tubes in the ten year old equipment are those that were in the sets when we bought them. Our replacement tubes are purchased directly from Motorola parts depot in Dallas.

When a tube is questionable, the location of the set will determine whether or not it is to be changed. If it happens to be in a unit near our Blytheville headquarters, the technicians will not replace it for a while. But if the set is many miles from the service shop, the tube is pulled out rather than risk an emergency service trip.

With a 11,000 square mile area to cover, our radio technicians travel in a well stocked maintenance vehicle. A sedan delivery truck is used to carry spare units, spare generators and a cabinet full of spare parts, as well as necessary measuring and testing instruments. When these men leave Blytheville on a 200 mile service run, they're afraid not to take along everything they might need.

With the system in good technical condition, the next prime requi-



Remote control console operates 250 watt 2-way radio base station at Jim Hill Plant, a main power source.

Arkansas-Missouri Power Company radio technician tests mobile unit at especially fitted test bench.

site for profitable use is a good operational technique. For the most part, our mobile units are installed on line trucks and service vehicles. Approximately 80 to 85 per cent of such vehicles operated by Arkansas-Missouri are radio equipped. The balance of the radios are in supervisory cars.

Very generally our radio system is used by service and line crews for communication between local offices and their field line crews and service technicians. Trouble calls, trouble reports, material and information requests, work assignments, routine crew reports are all standard every day communications.

Providing power to a farming area with a seasonally fluctuating population makes our turn-ons and shut-offs extremely high. At the end of a harvesting season, radio is especially helpful to the meter setters who are removing the meters from houses used by migratory workers. Our man is able to call in the final reading and then settle the difference between the last bill and the deposit before the family moves on.

Portables used for patrolling

"Handie-Talkie" portables are used for the most part in line patrolling and wire stringing operations. Many of our long lines are strung over private right-of-way inaccessible to trucks. Patrolling here is done on foot with the "Handie-Talkie" units being most useful instruments.

Of course, where a radio system really shows its worth is in the inevitable emergency. Last year, a severe ice storm wandered far enough south to really hit our lines. We feel the radio system regained 20% of its cost in that one emergency situation alone.

As a guide to what is expected of our employees as standard radio operating technique, we wrote up a 29 page booklet "Standard Radio Operating Procedure and Practices." The booklet is patterned after the recommendations of the National Committee for Utilities Radio with special provisions made for characteristics of the Arkansas-Missouri system.

The manual spells out definitions of various types of equipment and terminology used in the radio system — such as "station call" and "dispatch point." It lists types of authorized messages and authorized uses and users of the systems. It lists a priority of messages and procedure for use of the system in special public disaster conditions.

One of the more important sections of the manual is the part detailing control of the system. For example, it spells out that the system dispatcher on duty at the Jim Hill plant shall have direct supervision over the operation of all base stations and mobile units in the Arkansas and Boot Heel territory, even though the mobile units may be assigned to a specific base station.

The operating procedure authorizes and requires the system dispatcher to monitor all transmissions; to order any station to stop sending at any time without advance notice when that station is operating in a faulty or unauthorized manner; to require all stations to follow any transmission schedules or special priority conditions; suspend temporarily the radio operating authority of any person who is violating any radio operating rule or regulation (final suspension in hands of chief engineer) and to modify radio rules as necessary during a period of emergency.

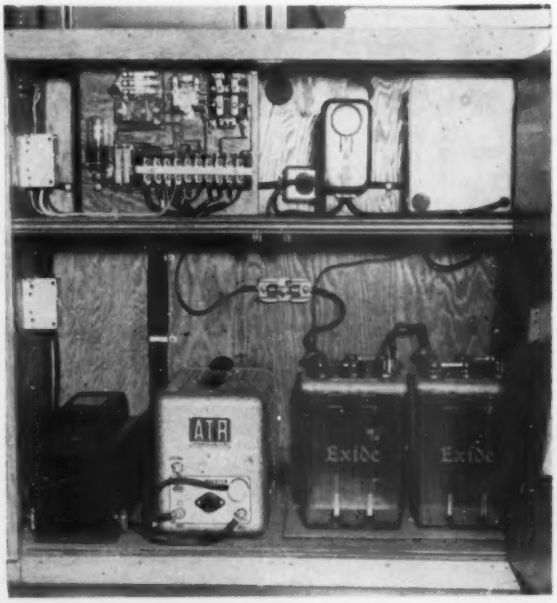
Base station control point operators are responsible to the system dispatcher for all dispatch points associated with the station.

Special attention is given to use of the push-to-talk button on the microphones, volume control, squelch control and other basic techniques in operation of the mobile units.

The booklet contains information on routing of traffic in cases of loss of wire line or carrier telephone communications and written log and report keeping.

After a briefing on importance of brevity, the manual contains a section on code words and a longer

(Continued on page 76)



Arkansas-Missouri Power Company finds that 25 watt utility base stations provide up to 20 miles range — adequate for local control of vehicles. Battery and inverter, above, form emergency power supply.

Wanted: Manuscripts for publication

The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in South and Southwest.

Articles are wanted in two principal classifications:

Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

Utility Engineering: **Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

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Easy to install . . . requires shallow hole . . . fixture can be removed and replaced without loosening anchor . . . a few hammer blows set anchor firmly . . . conical-shape nut expands lead sleeve to provide strong holding power . . . widely used by electricians, plumbers, carpenters, ornamental iron workers, maintenance men, awning and sign men and other tradesmen.

Cutaway drawings show how setting tool expands lead sleeve around conical nut.

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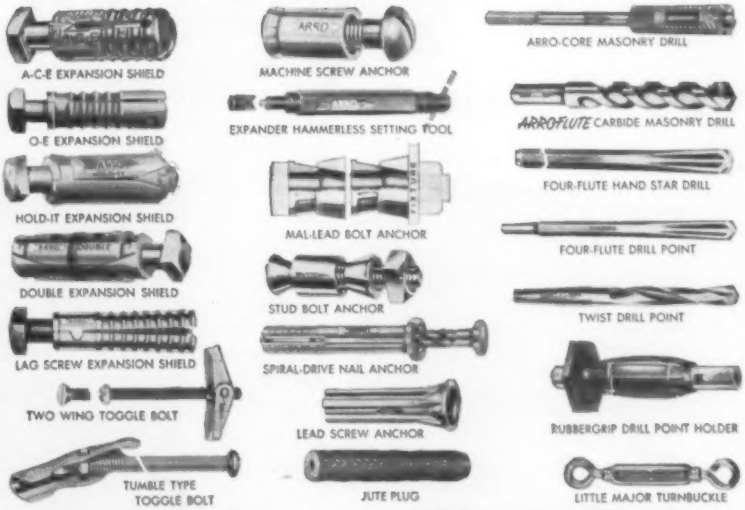
Expander hammerless setting tool for easy installation of Arro Machine Screw Anchors in hollow tile, bottomless or weak-bottom holes.

THE TRADE ARRO MARK LINE OF MASONRY ANCHORING AND DRILLING DEVICES



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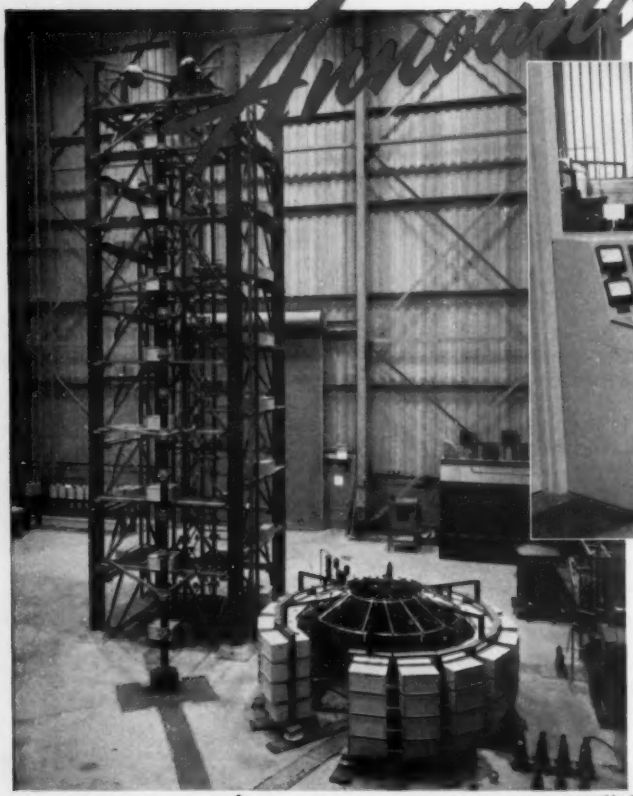
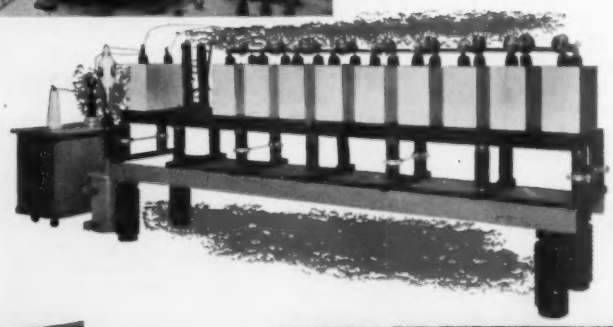
Announcing ... NEW



Nerve center of the laboratory—this master console permits control of all major equipment in both the outdoor and the indoor laboratory. Unique instrumentation includes interlocking controls, high speed recording devices for diverse, precise testing.

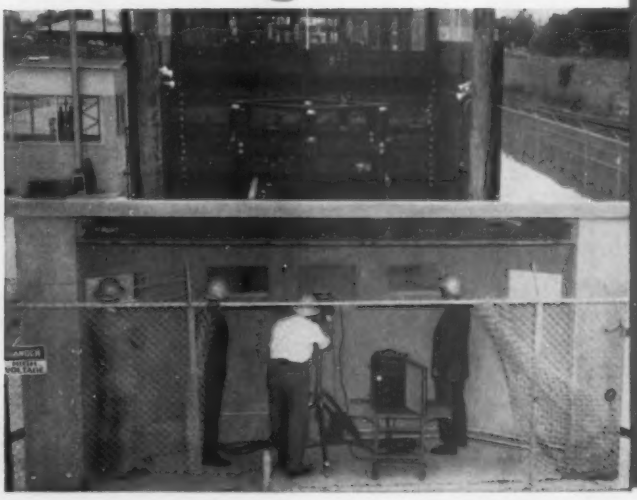
Here a 3,200,000 volt surge generator—powerful enough to spark over a 17 foot gap—simulates lightning effects on electrical equipment. High surge current generator is seen in the foreground.



Of the five lightning generators included in the laboratory this 500 kv generator can be adjusted to produce a variety of waveshapes

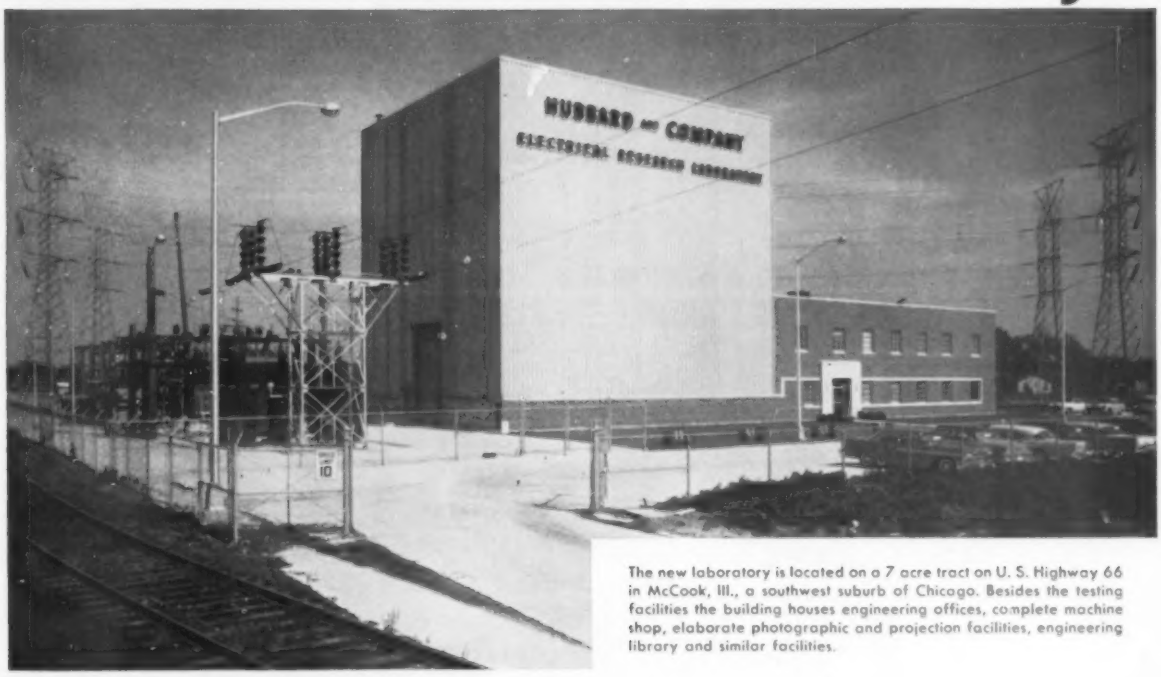
THESE FACILITIES ARE DEDICATED
TO THE ENGINEERING PROFESSION
AND TO THOSE IT SERVES, FOR
THE CONTINUED IMPROVEMENT OF
ELECTRICAL PRODUCTS AND SERVICE
IN THE HOME AND IN INDUSTRY

Bronze dedication plaque at entrance to laboratory.



Outdoor laboratory—for comprehensive electrical and mechanical tests on full scale, live operating systems.

HUBBARD Research Laboratory



The new laboratory is located on a 7 acre tract on U. S. Highway 66 in McCook, Ill., a southwest suburb of Chicago. Besides the testing facilities the building houses engineering offices, complete machine shop, elaborate photographic and projection facilities, engineering library and similar facilities.

What is it worth to KNOW?

What is it worth to know just what is needed in electric distribution equipment...to know just how to make it so that it will stand up under ALL conditions...to know just what steps are necessary to make a particular piece of equipment do a better job than was ever done before?

A number of years ago we reached the decision that KNOWING would be worth *whatever it cost*...and out of this decision came the now completed Hubbard Electrical Research Laboratory. Its purpose is to give new wings to Hubbard product design and development...to do this by integrating all engineering research and testing facilities in one area...to make development, research and testing as it should be ...a creative guild unto itself!

Yes, the laboratory is new; but not the idea on which it was built. Those who know Hubbard equipment realize that the higher standards to which Hubbard equipment has been held across the years is a basic result of the greater emphasis we have always placed on the testing phase. No one has ever gone further into this phase than Hubbard and Company. But now we have gone *still further*.

We have literally brought the field into the plant!

In this research center we can truly duplicate the worst possible conditions under which utility equipment can be expected to function. In it we can determine what to make and how to make it. In it we hope to find the means of solving problems heretofore unsolvable.

A few of the facilities are briefly described here—more fully in a new brochure available for the asking. Those who have an interest in the work we are doing are cordially invited to make a personal inspection of the new laboratory.

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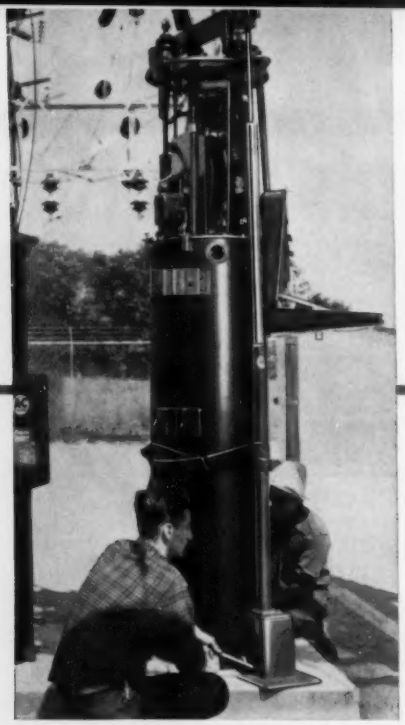

Convenient, easy-to-use hydraulic untanking jacks are available to all Allis-Chalmers regulator users.

Mobile unit carries all needed tools and repair parts. Oil storage tank, filter press and dielectric oil tester are in trailer.

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NEW Field Service Unit

combines regulator training and service

Mobile service unit brings trained service personnel and instruction on preventive maintenance to regulator site.

THIS mobile unit has proved to a growing list of utilities the economy of preventive maintenance on a planned program.

Utilities are encouraged to have their own men participate for training.

The service includes detailed inspection of mechanism, checking band width, voltage level, and relay contacts, retouching paint, replacing parts and filtering oil if necessary . . . thus extending regulator life . . . eliminating potential troubles.

All service, whether for single or three-phase regulators, is done at the regulator site. Full advantage is taken of *unit construction* of Allis-Chalmers regulators. Downtime is reduced.

See New Movie

Additional information in colored 16-mm sound film can be obtained by contacting your nearest A-C office or writing Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

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No fancy names—no confusing claims.
Just the best in wire and cables.

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When you call for cable, call for Carol

Carol®

CAROL CABLE COMPANY • Division of the Crescent Co., Pawtucket, Rhode Island

NEMA

Transportable diesel-powered peaking is economical low load factor power

By B. H. Hefner
Chief Electrical Engineer
Electro-Motive Division
General Motors
La Grange, Ill.

◆ THERE IS a recognized need by utilities for an economical source of power generation to handle *low load factor* loads. The utilities need a reliable block of power of approximately 5000 kw to "lean into" an existing system and to supply power on short notice at a low over-all cost.

The Model MU-60 power block has been designed specifically to fill this need. It will fit any application where bus voltage is continuous and the requirements are for additional power for any of several reasons such as system peaking, voltage boosting, ready reserve, etc.

The MU-60 is a 6000 kw, 4160 v. power generation package consisting of (3) engine-generator units and a centralized electrical control unit. They are designed to operate as unattended fully automatic units supplying full load power into a utility system.

The engineering design work on this package was governed by a set of ground rules which were believed to be paramount if the optimum benefit of this power equipment was to be realized. These rules and some general statements regarding our efforts to meet them are as follows:

1. Low Cost—Frills have been omitted, duplication of equipment avoided, new components designed, labor saving techniques utilized in order to keep cost to a minimum without sacrificing quality.

2. Reliability—Of utmost importance in all design considerations. Static control equipment has been employed and circuitry has been designed for simplicity and fail-safe operation. Special relays have been used and troublesome control devices avoided, all with a view to give maximum performance reliability.

3. Ease and Economy of Installation—Factory assembled unitized design requires a minimum of field engineering and construction. Customer's mechanical and electrical connections kept to a minimum and made convenient.

4. Ready Availability—System is kept warm and in readiness for immediate use. Controls are designed for getting full power output with a minimum delay.

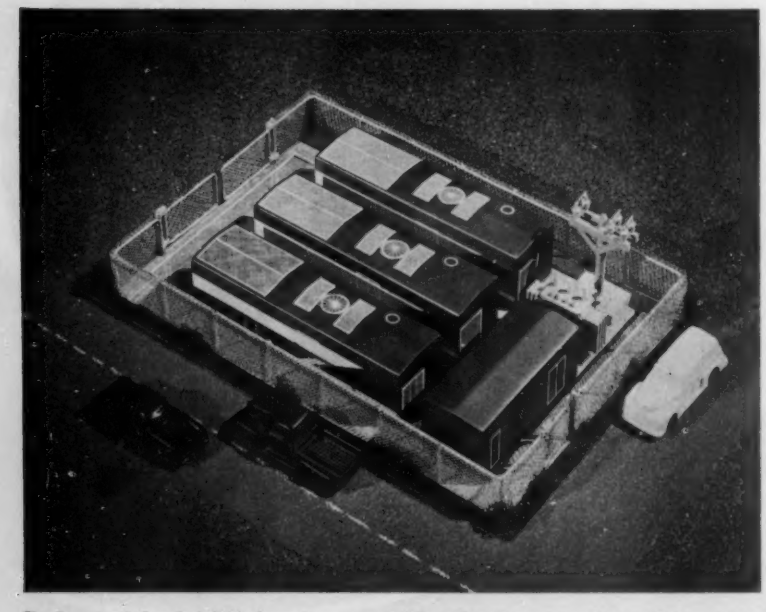
5. Minimum Maintenance and Ease of Servicing—Equipment is designed and arranged for minimum maintenance and is readily accessible for inspection and servicing.

6. Portability—Units are of a size, weight and shape that can be readily transported to the initial installation or relocated when necessary.

The power generating unit is a unitized package and has a 2000 kw capacity. Each unit is 38′ in length, 10′6″ in width and 11′4″ in height. Its weight is approximately 103,000 lbs. less supplies, such as lube oil and water, and 107,000 lbs. with supplies. The design is such that it can be completely assembled and tested at our plant and it is readily portable because its physical dimensions and weight are such that it can be shipped on a standard flat car and can be easily moved from the flat car to a location on a low-boy type of carrier.

A typical power unit contains the prime mover, the alternator, cooling system, lube oil system and fuel system. The engine cooling system consists essentially of the radiator assembly, engine driven fan and automatic by-pass valve for water temperature control. The system is a semi-sealed design and requires no regular or routine maintenance.

The lube oil system contains the necessary strainers, filters, lube oil cooling and engine driven pump. Surplus capacity of lube oil reserve and filtering have been added to comply with the original ground



Scale model of 6,000 kw transportable diesel-powered peaking plant.

plant source

rules of reduced maintenance and service requirements.

Fuel is supplied to the engine by an engine driven pump, through suction strainers from an onboard fuel tank, which in turn is supplied by an electric pump from a common storage tank. For reliability, dual electric fuel pumps are installed to assure a continuous fuel supply.

The engine governor is an electro-hydraulic type which was especially designed to assist in fast synchronization.

The prime mover used in this power generating unit is similar to the type of engine produced for many years at Electro-Motive. We have produced 35,101,890 horsepower in this type engine and it is being used in many different applications.

The starting motor consists of a dyer drive and solenoid arrangement. This was especially designed for this application. Its operation is very similar to that used on our present day automobiles.

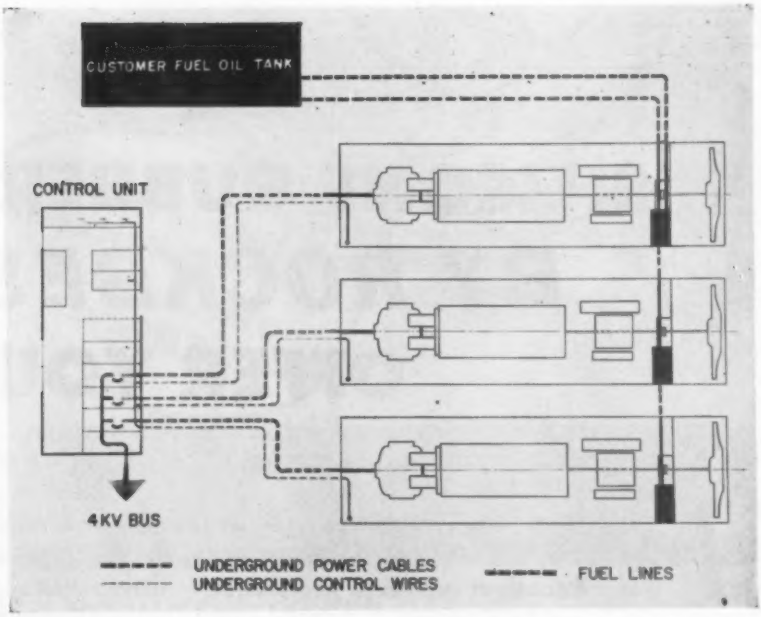
The combustion air for the prime mover is admitted to the engine room through pre-oiled filtered panels in the end of the hood. These filters require a very minimum of service and can be readily replaced. Oil bath type filters are provided for the engine air intake and these can operate for extended periods without servicing.

For cold weather protection of the engine and its associated equipment and to keep it in readiness for immediate service, automatically controlled immersion heaters have been installed to keep the engine water and lube oil warm. The heating arrangement has been designed with a very minimum of controls and requires no routine maintenance. There are no relief valves, operating valves, or thermostats in the lube oil system.

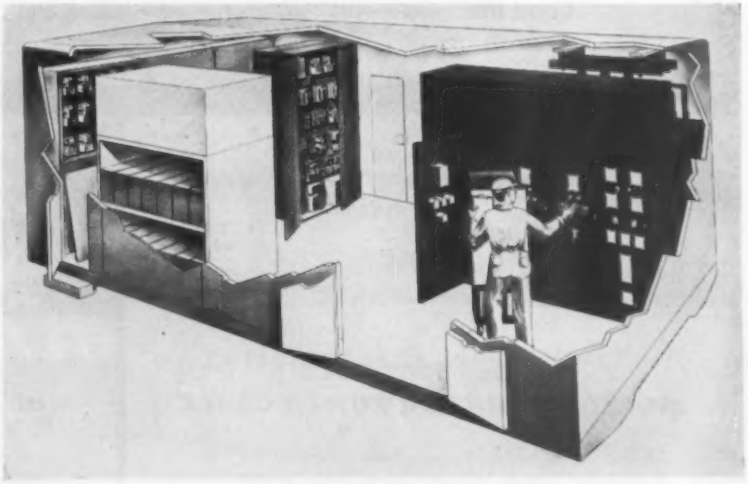
Alternator and exciter

The alternator is a salient pole machine rated at 2000 kw and 4160 volts. It is insulated electrical-

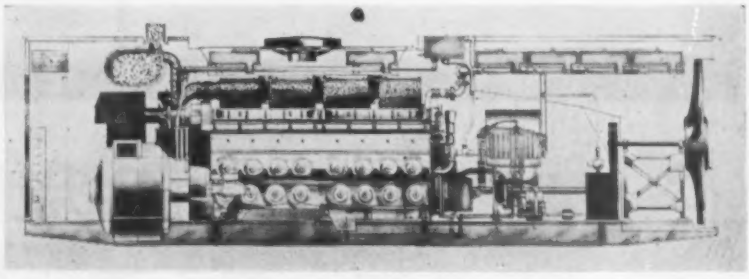
(Continued on page 117)



Electrical and fuel interconnections for field installation of MU-60. All that the utility company must do to the factory assembled and equipped peaking plant is to provide base, set equipment and lay underground cables as indicated in the drawing.



Cutaway drawing arrangement of MC-36 centralized control unit equipment.



Sideview drawing showing arrangement of components in one of the three 2000 kw units (the MP-36) that make up the 6000 kw peaking plant.

SILICONE RUBBER INSULATED
BY ROCKBESTOS
OFFER YOU:

Excellent dielectric strength — electrical properties remain constant from −130°F to +500°F.

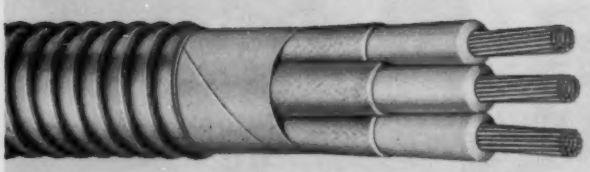
High heat resistance — better than any type rubber insulation. Long service life in temperatures to 125°C (power cables) and 200°C (other applications).

Excellent moisture resistance — unrestricted applications in wet or dry locations — equal to the best grades of rubber. No lead sheath required.

Greater ozone resistance than the best grades of rubber insulated cables.

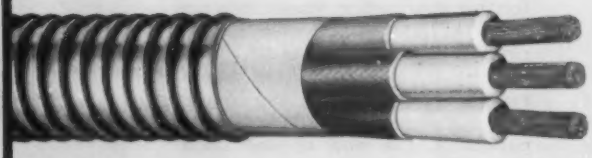
Excellent resistance to chemical attack — being chemically inert, silicone rubber insulations resist effects of lubricating oils and most corrosive atmospheres.

Long life — excellent resistance to weathering and aging.



600 and 5000 VOLT MULTI-CONDUCTOR POWER CABLE

Silicone rubber insulated power cable combined in a 3 or 4 conductor conduit, with interlocked armor overall . . . easily installed with simple supports . . . eliminates conduit . . . greater current carrying capacity for economical power distribution.



MULTI-CONDUCTOR CONTROL CABLE

For use in steel mills, power stations, boiler rooms, automotive, ceramic and glass plants as well as other industries where control and signal circuits or control equipment are exposed to high ambient operating temperatures.

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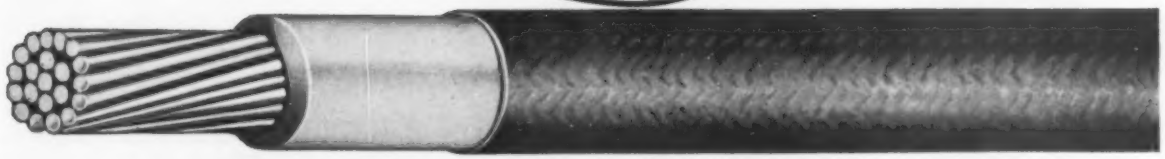
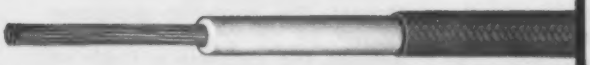
WIRES



SILICONE RUBBER INSULATED POWER CABLE 600 and 5000 VOLTS

For high temperature circuits either in wet or dry locations, exposed or in conduit. This cable is recommended for use in steel mills, power stations, heat treat areas, boiler rooms, foundries, smelters, etc.

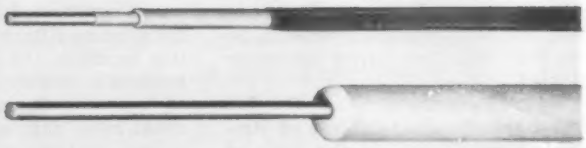


MOTOR LEAD and APPARATUS WIRES

For leads to motors, transformers, etc., requiring a flexible wire in high temperature locations or applications.

APPLIANCE and FIXTURE WIRES

For use in wiring high wattage units when operating temperatures reach 150°C and 200°C. Lighting fixtures, clothes dryers, electronic equipment, stoves, water heaters, ovens, therapeutic devices, space heaters are among the many products for which these wires are recommended.



HEATING CABLES and DEFROSTING WIRES

Heating cables are ideal for use in pipe heating, surface heating, roof de-icing and soil heating.

Defroster wires being odorless and tasteless are perfect for use as rapid defroster heating element in electric refrigerators and freezers.

ROCKBESTOS

For complete details on Rockbestos Silicone Rubber Insulated Wires and Cables send for Catalog SR58.

Power company's liability as to customer's wiring

By Arthur L. H. Street
Attorney-at-Law
Biloxi, Miss.

◆ Most power company service departments are wary of operations which may make the utility company liable for hazards to life and property as a result of defects in the customer's wiring. A decision of a Louisiana court recently held the power company liable for damage that occurred after a fuse changing incident. The circumstances indicate justification for careful study of such operations.

THE PROBLEM: Lightning struck a power company's transformer which served only plaintiff's farm premises. The company installed a new transformer and shortly later replaced a fuse in plaintiff's barn and turned on the current without inspecting plaintiff's wiring and appliances or giving him any sort of warning of possible danger. About thirty minutes after they left, the barn was discovered to be on fire. Was the power company liable?

COURT'S ANSWER: Yes. So decided the Louisiana Court of Appeal, First Circuit in the case of Hughes v. Louisiana Power Co., 94 So. 2d 532.)

These additional facts were involved: The company's 2400-volt power line brought the current to the transformer, where the current was transformed into 220 volts for the barn machinery, and 110 volts for the house and other lights. From this transformer some current went to the residence, some to the barn. The current to the barn passed through the main switch-box, where there were two fuses. From one fuse, the current operated the barn lights. From the other the current (passing through another fuse several feet away for a milking machine) operated the milking-machine and perhaps other machinery.

Following installation of the new transformer, service was restored except for that leading from the fuse in the barn switch-box which served the milking-machine. On their second visit, defendant's servicemen pried loose with pliers this fuse, which was burned and charred, and inserted another fuse furnished by the patron, and the milking - machine commenced operating. Shortly after this the fire was discovered.

Gist of opinion

The highlights of the court opinion are as follows:

"Defendant vigorously assails" the lower court's "finding that: 'When the new fuse was placed in the box by the employees of the defendant company, it completed the circuit which allowed the flow of electricity into all of the wires in the barn and unquestionably precipitated the fire.' However, we believe this finding supported by the preponderance of the evidence, including the short time interval; the fact that no trouble in the wires manifested itself since their installation fifteen months prior to this incident; the testimony of defendant's employees that a surge of lightning through the fuse-box could have damaged the electrical wiring system on the other side thereof; the uncontradicted testimony that after the fire every wire leading out of the fuse box (but not those leading in) were burned and were burned along the wall near the fuse box, from the switch and up into the attic. We note that defendant's electrical engineering expert with praiseworthy frankness testified:

"Q. Is it possible that, and even probable, that the lightning surge that hit the transformer could have deteriorated the wiring in the barn, creating a dangerous condition?

"A. ..... under certain conditions, and in this instance particularly, it is a very good probability.

"We may add that although defendant urges that perhaps the hosing of the floor or other causes may have intervened to cause the fire by wetting the wires, that the record is devoid of any evidence as to such other causes. For instance, the wires were situated on the wall and ceiling, and only the floor was hosed, and plaintiff's wife testified that there was no possibility that water had gotten from the floor to the wall and ceiling.

"* * * Both parties cite to us the Annotation, 'Liability of electric company to one other than employee, arising from its failure to shut off current,' 32 A.L.R. 2d 244, at page 249, Section 9, 'Defects in customer's equipment'. Defendant's brief concisely summarizes the rule of law applicable as follows:

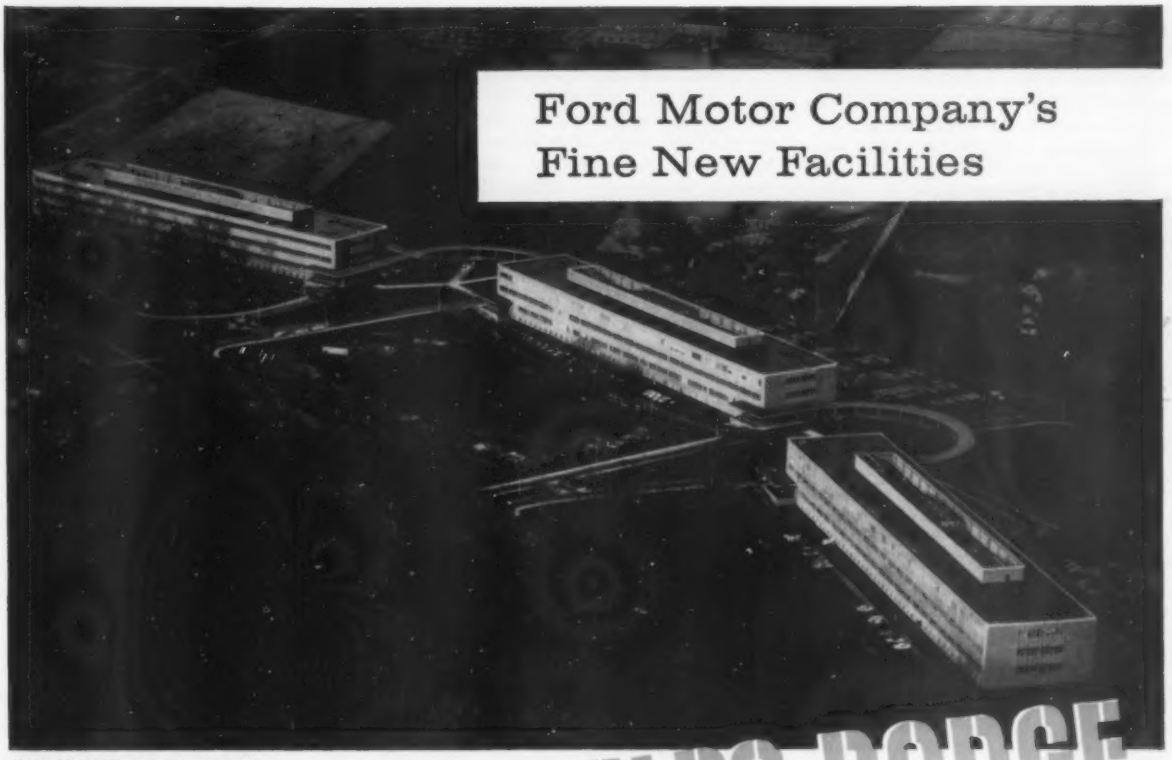
Knowledge controlling factor

" 'Generally, where an electric company furnishes current to wires or appliances maintained by a customer, and, because of a defect therein, the passing of current through the wires or appliances results in personal or property damage, the company is liable on the ground of neglect in not shutting off the current, or in continuing to furnish it, *provided the company knows, or should know, of such defect.*'

"However, an electric company is not liable for damages arising from its failure to shut off current passing to a customer's wires or equipment, where the company is *without knowledge of any defect.*

"The duty and responsibility of a mere generating company is generally held to be limited to making a proper connection and delivering the electric current to the purchaser's wires and appliances in a manner which, so far as such delivery is concerned, protects life and property, and there is no duty of inspection to see that the purchaser's wires and appliances are in a safe condition and kept so.

"Accordingly, where wiring or other electrical appliances on private premises are owned and controlled by the owner or occupant of such premises, a company which merely furnishes electricity is not



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WIRE BY PHELPS DODGE

These new buildings for the Staff and Product Engineering activities of the Ford Motor Company at Dearborn, Mich., are striking examples of structures designed to provide for the specific needs and comforts of the people who work there.

Only the finest equipment has been installed in these buildings, including electrical wiring of the highest quality, consisting of dependable Phelps Dodge building wire and Phelps Dodge paper-insulated lead-sheathed power cable.

On every wiring job where top-quality performance, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

PHELPS DODGE COPPER PRODUCTS
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responsible for the insulation or condition of such wiring or appliances and is not liable for injuries caused by their defective condition, to such owner or occupant . . .

"However, 'knowledge of the defective and dangerous condition of a customer's appliances will charge even a mere generator and supplier of electricity with liability for consequences, where current is thereafter supplied to such defective and dangerous appliances, in which case it is the energizing of the line, with knowledge of the conditions, and not the conditions themselves, which forms the basis of liability', 29 C.J.S., Electricity, Sec. 57, pp. 611-613. See also 18 Am. Jur. Verbo "Electricity", Sections 46-53, 62, 85, 100.

"Counsel for defendant urges that the judgment in effect constitutes the defendant company the insurer of its customers, and a duty, to inspect fully the wiring of its customers after an interruption of the service. We are reminded that the action of defendant's servicemen herein in helping this lady replace her burned fuse was an instance of defendant's humane and public-spirited attitude in the interest of good public relations in helping customers, particularly women and children, rather than requiring them to call their private electricians.

"Defendant urges that even had its servicemen inspected the wiring before resuming service, perhaps the perforations in the wires may have been so small as to escape notice, or so hard to find and so long to search for, that to impose this duty upon defendant power company would be unreasonable.

"However, defendant overlooks that liability herein is imposed, if at all, not upon defendant's failure to inspect the customer's wiring, but upon its resuming electric service with actual or presumed knowledge that due to lightning damage plaintiff's wiring was or might be in a dangerous condition. It is necessary for us to determine how great defendant's duty was before it turned on the current, if charged with actual or presumptive knowledge of the potential danger to its customer's premises through this damaged wiring — whether, for instance, a simple warning rather than an inspection would discharge this duty. Defendant's servicemen simply replaced the charred fuse, after having changed the burned transformer, without discussing and probably without thought of the potential hazard, in their haste to service other storm-caused troubles.

"Thus, the legal issues require our determination whether defendant through its employees can be charged with knowledge of the hazardous condition of plaintiff's wiring potentially created through the lightning damage to its transformer and the surge of great electric current past the fuse into the wires.

"Defendant urges that the District Court erred in finding: 'They knew the transformer had been blown out by being struck with lightning.' This finding is supported by the testimony of Mrs. Hughes that the servicemen so informed her, by the circumstances of the stormy night with many lightning flashes from which such servicemen could reasonably infer that such was the cause of the sudden interruption of electrical service, or held to knowledge that such was the probable cause thereof.

"This knowledge, especially with their finding the charred fuse lead-

(*Continued on page* 111)

Transmission line load capacity boosted 50% by series capacitor

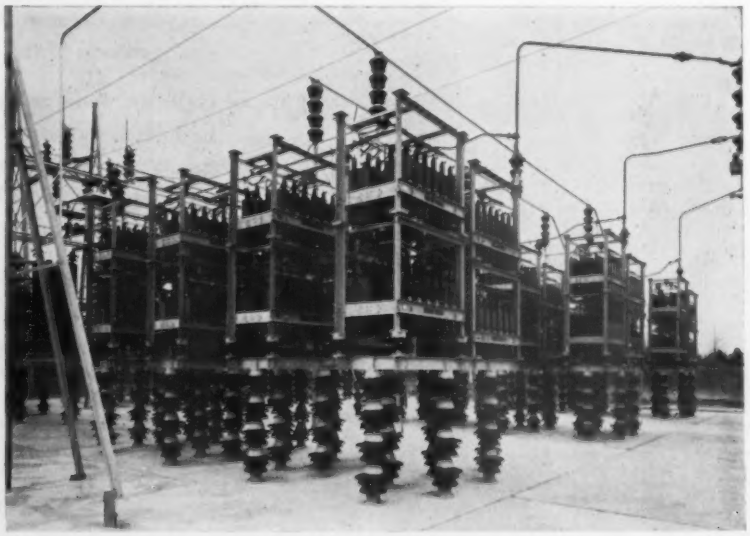
◆ ONE OF THE LARGEST high voltage series capacitor installations in the world has been energized on the lines of the Louisiana Power and Light Company.

Rated 57,600 kilovars, 115/161 KV, 60 cycle, 600 amperes, three-phase, the series capacitor application enables the utility to economically push large blocks of power from southern Louisiana to the northern part of the State over a new transmission line which parallels a smaller, existing line.

The series capacitors reduce inductive reactance for the new, larger conductor. As a result, upon energization the circuit load was increased from about 60,000 kilowatts to 90,000 kilowatts, with capacity for an even greater load. The series capacitors also decrease system losses and voltage drop.

The installation is located at the Louisiana Power and Light Company's Bogalusa Station, 50 miles north of New Orleans.

All accessories for the capacitor bank, including relays, switches and controls, are automatically operated.

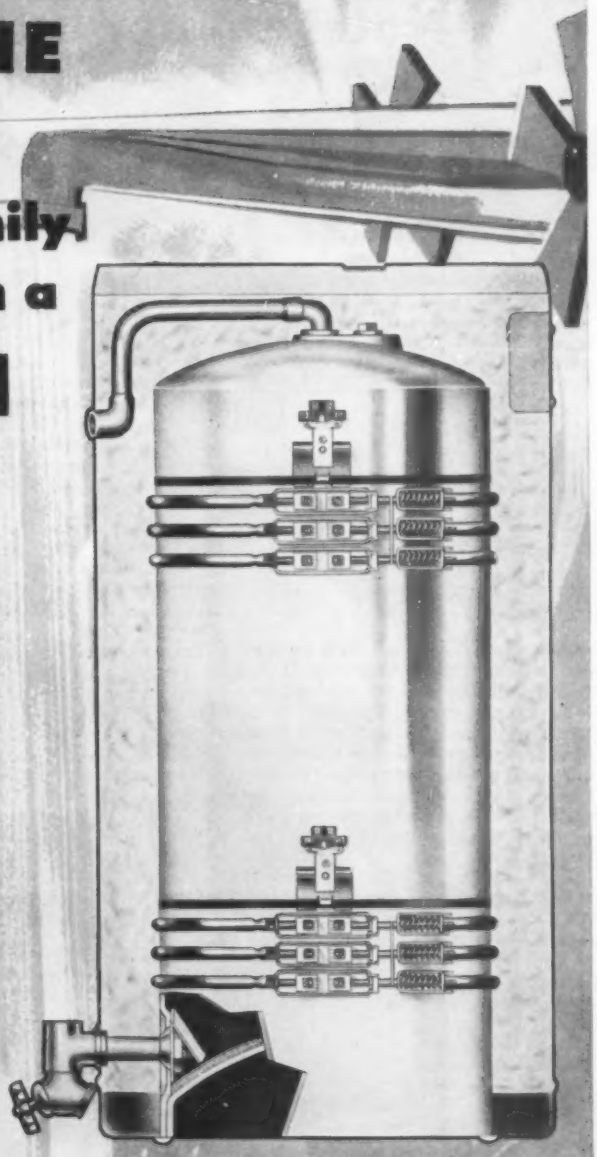


Rated 57,600 kilovars, 115/161 kv, this series capacitor at Louisiana Power and Light Company's Bogalusa Station has increased the capacity of a key transmission line some 50 per cent. (Photo courtesy General Electric Co.)

NOW—ALL THE HOT WATER

that any normal family will ever want—from a

40-GALLON TANK!



New Hotpoint SUPER-SPEED Water Heaters are *RIGHT* for 95% of your customers.

Here's tremendous hot water production in a bare minimum of space. Calrod® Magic Circle heat delivers 470 gallons of hot water every 24 hours... and it will raise 18 gallons 100° in just one hour. Even from a cold start, it will heat water for 3 shower baths in 25 minutes.

Hotpoint Quick-Recovery Water Heaters save space and simplify installation. And the new miracle MLC-7 additive in Perma-Seal models can increase the life of the tank by 200%!

SUPER-SPEED Water Heaters will help you put more POWER in "House-Power"—more LIVING in "Live Better . . . Electrically!"

WRITE TODAY FOR COMPLETE DETAILS ON ALL 4 HOTPOINT SUPER-SPEED MODELS

Hotpoint

LOOK FOR THAT DIFFERENCE! (your customers do!)

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44, ILLINOIS

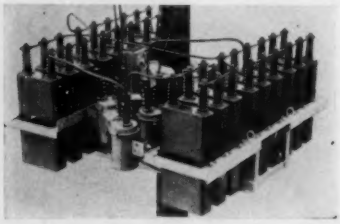
ELECTRIC RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • COMBINATION WASHER-DRYERS
CUSTOMLINE • DISHWASHERS • DISPOSALLS® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • TELEVISION

Notes on new utility equipment

Twin cluster-type capacitor fixed and switched equipment

TWIN CLUSTER-TYPE capacitor equipment so perfectly balanced it virtually eliminates bending moment on the pole is now available from the General Electric Company's Capacitor Dept., Schenectady 5, N. Y.

Designed to meet the demand for larger capacitor banks on utility distribution feeders, the new pole-top equipment is available in ratings



from 600 to 900 kilovars for 5-kv systems; 600 to 1200 kilovars for 15-kv systems; and 600 and 900 kilovars for 25-kv multi-grounded systems.

This equipment consists of 50 kvar capacitors mounted in two aluminum racks, and a compression-type cluster bracket. This bracket compresses the pole to hold the equipment securely in place, eliminating the need for through bolts.

New design of the equipment makes installation fast and easy. After the cluster-type bracket has been secured to the pole, the capacitor assemblies are hoisted and bolted into place. Arrangement of the equipment allows free climbing space in excess of 36 inches.

Both fixed and switched equipments are available, with easily accessible switches mounted to the frame. Since both the aluminum rack and the capacitor cases are made of corrosion-resistant material, the equipment will need no protective maintenance.

For additional data, ask for item U-801, using the coupon on page 119.

Neoprene coated dead-ends for weatherproof conductors

NEOPRENE COATED dead-ends are now produced in all sizes for jacketed all-aluminum and ACSR conductors by Preformed Line Products Co., 5349 St. Clair Ave., Cleveland 3, Ohio. They provide a neat, safe and permanent installation. The Preformed dead-ends are applied directly on the jacketing; no stripping is required. Full protection is possible because the conductor is not exposed at any point.

The application is easily made by

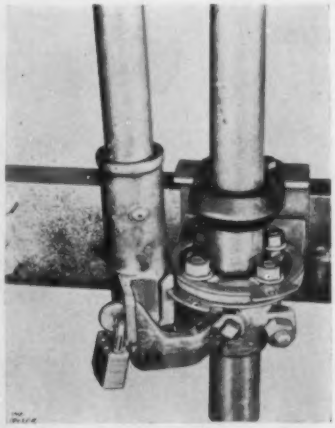
hand; no tools are needed. There are no sharp edges to cut into the conductor's jacketing, no concentrated stress or fatigue points and no bolts to come loose. The neoprene coating on the dead-ends aids in their application and removal and protects them from corrosion. They are ideal for use in highly corrosive areas both coastal and industrial.

The Preformed principle, low unit pressure distributed over a large area, creates the exceptional holding quality in these dead-ends. Preformed neoprene coated dead-ends develop more than sufficient holding strength for the maximum loading conditions normally anticipated in field service. They will neither slip nor damage the jacketing material. They hold satisfactorily under design tension in all weather conditions and temperature ranges.

For additional data, ask for item U-802, using the coupon on page 119.

Operating handle facilitates switching

A HINGED torsional handle for manual operation of power switches has been designed by Line Material Industries, McGraw-Edison Co., Mil-



waukee 1, Wis. The improved design is applicable to all vertical-pipe operating mechanisms rotating through a range of 180 degrees or less. L-M's sealed - contact, multi - revolution grounding ring is optional.

Main features of the new handle include optional up or down hinging of the handle, clockwise or counter-clockwise rotation, simple stepless adjustment of "open" and "close" stops, and automatic unlatching.

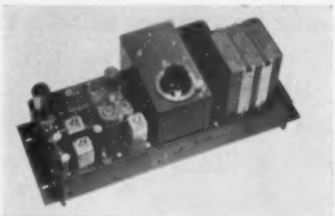
Additional features are simplicity of positioning handle with two stainless steel self-piercing set screws, choice of wood or steel 36-inch handle, and ease of locking with free-hanging padlock. The mounting plate may be bolted direct to a pole or a substation structure. A cooper bushing in the mounting plate guides the operating pipe and allows freedom of rotation.

Multi-revolution grounding ring is another application of the sealed current interchange used in Type PV2 power switches. Silicone grease and silicone cord rings completely weatherseal the contact surfaces. The ring provides positive grounding and eliminates the use of flexible braid.

For additional data, ask for item U-803, using the coupon on page 119.

Power line carrier equipment transistorized

MOTOROLA, INC., 4501 W. Augusta Blvd., Chicago 51, Ill., announces the complete transistorization of its fre-



quency shift power line carrier equipment, a development that contributes greatly to increased system reliability.

The unique requirements of frequency shift power line carrier and the performance characteristics of the Motorola equipment provide ideal parameters for transistor application with consequent increased reliability.

The life span of the transistor itself far exceeds that of an equivalent tube circuit. Also, transistor failure, when it does occur, is evidenced first by a gradual deterioration in circuit operation, while a certain percentage of rapid tube failures occur at unpredictable times in the form of filament burnouts.

The new Motorola equipment contains easy-to-operate metering facilities which enable comprehensive preventive maintenance through close measurement of circuit performance.

FREE

with the

HYLUG KIT #11

Bolt Cutter

Wire Cutter

Indentor

Wire Strippers

Thread Chasers

Insulation Grip Closers

Come and get 'em . . . a $3.95 tool FREE in every kit . . . a tool with all the features you've been looking for . . . crimper and wire cutter in the nose, wire stripper, the slickest bolt cutter you've ever seen . . . and handles that fit your hand like a glove. And what a buy in the kit itself . . . 250 one-piece HYLUGS packed in 3 Flip-Top boxes . . . 18, 14 and 10 sizes. Flip them out as easily as you flip a cigaret out of its pack. This is an offer you don't want to miss. Don't wait . . . call your local BURNDY distributor now . . . he has kits in stock and will be glad to show them to you. HYLUGS in Flip-Top boxes come in 29 popular sizes.

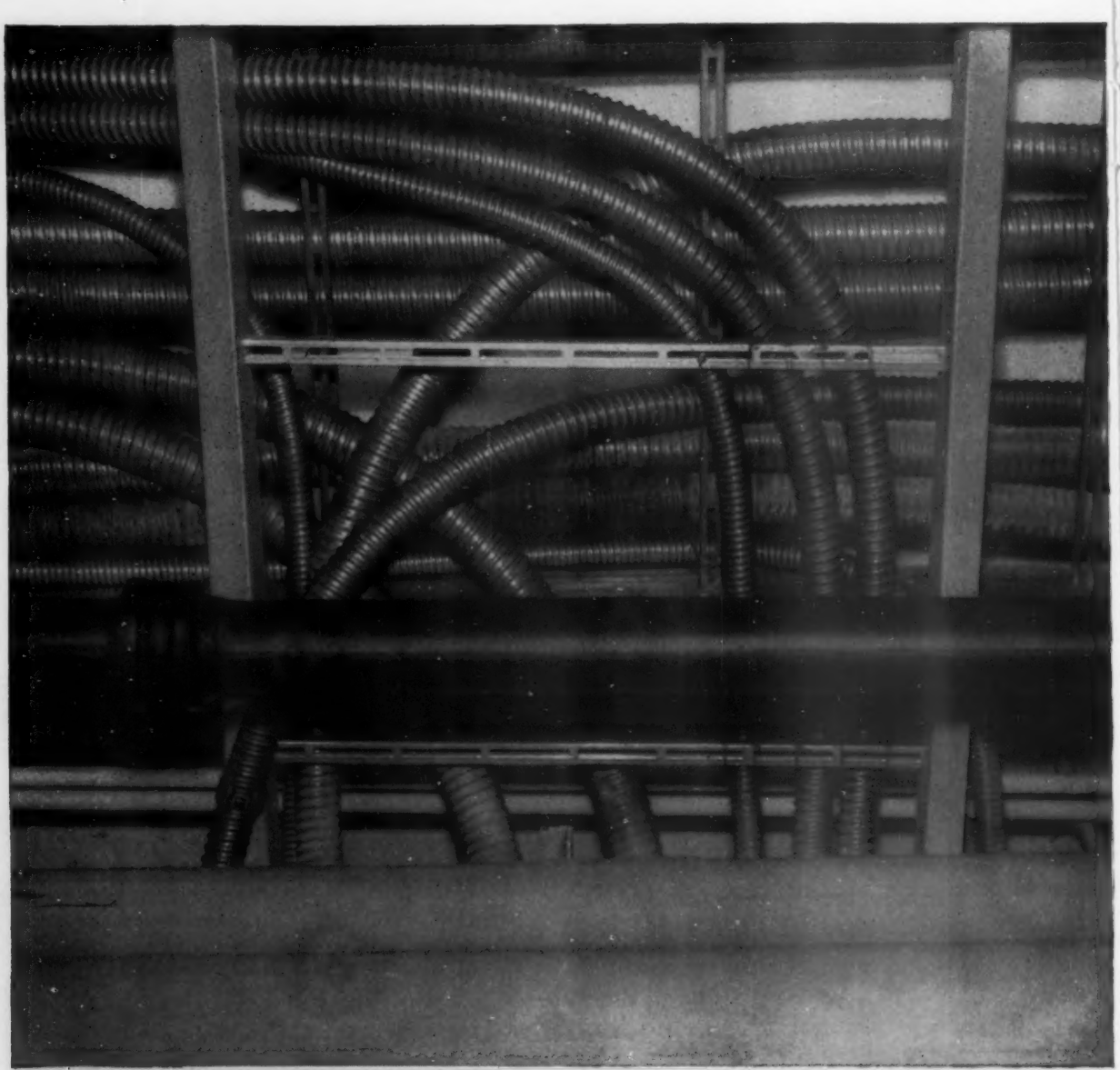
Items bought separately cost $11.45

price of Kit #11 complete with Y10M HYTOOL **$6.50**

BURNDY, Norwalk, Connect. or Toronto, Canada

BURNDY

58-8



CREDITS—Owner: SCHLEGEL MANUFACTURING COMPANY, Rochester, New York; **Electrical Contractor:** T. H. GREEN ELECTRIC COMPANY, Rochester, New York; **Builder:** JOHN W. RYAN CONSTRUCTION, New York City; **Architect:** SERGE P. PETROFF, New York City; **Structural Engineer:** STROBEL AND SALZMAN, New York City; **Construction Engineer:** GUY B. PINERO, New York City.

USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

You could do this with conduit but think what it would cost!

JUST IMAGINE THE MAN-HOURS that would have been required to bend and contort steel conduit to fit this maze-like 480-volt, 3-phase, 4-wire industrial distribution system. We don't know how much more a conventional installation of cable-in-conduit would cost because Schlegel Manufacturing Company chose the sensible way out: flexible, easily installed USS Tiger Brand Armorlokt Interlocked Armored Cable.

Saves time—We know, from experience on other jobs, that a conduit system would have required about twice as much time to install. It would probably have required larger size cable, because of the higher voltage drop. It would have required about three times as much material.

Easily changed—Most important, though, this Armorlokt installation gives Schlegel Manufacturing Company a far more flexible and *revisable* installation. Machines can be moved and the electrical distribution system easily adapted to the changes when accessible, easily traceable Armorlokt is used.

Cuts cost—Past experience shows that a Tiger Brand Armorlokt installation on factory-made racks can cut installed cost as much as one half compared to conventional distribution systems. Also, it requires less space—often a major consideration in crowded factory areas. It can be installed inside or outside . . . is available in voltage ratings from 110 to 15,000 . . . with galvanized or stainless steel, aluminum, or bronze armor . . . with polyvinyl chloride jackets *over the armor* in especially corrosive applications.

USS, Tiger Brand and Armolokt are trademarks

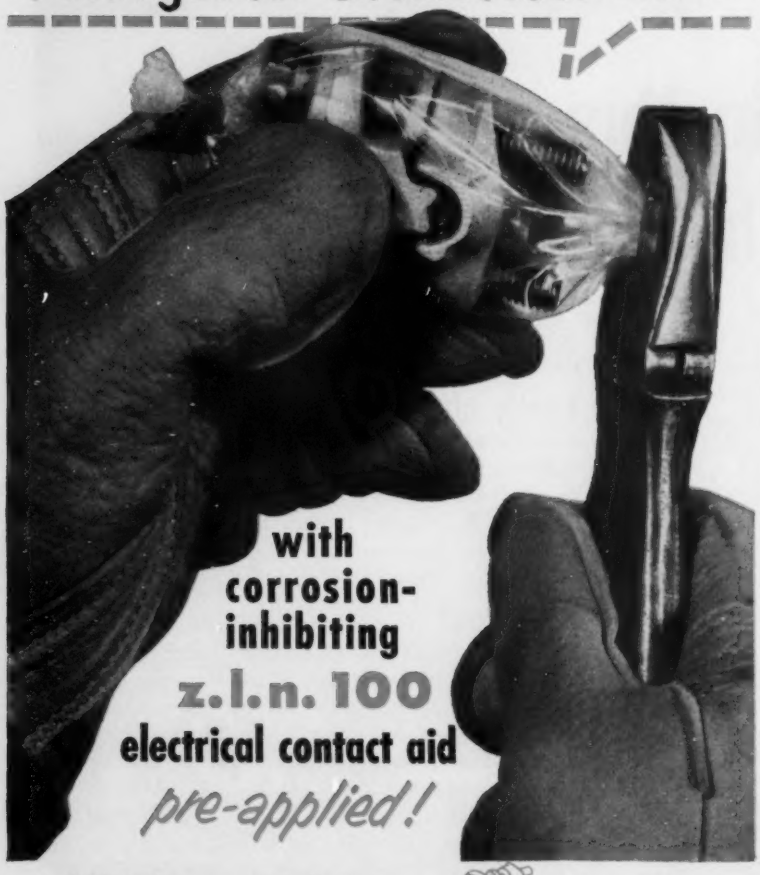
Write for complete facts. Or call the nearest American Steel & Wire Sales Office. American Steel & Wire, General Offices: Cleveland 13, Ohio.

Step-down. Incoming voltage to Schlegel Manufacturing Company's main plant substation is 33,000 volts. This is stepped down to 480/277 volts, 3 phase, 4 wire, and distributed to unit substations like this one, where voltage is stepped down to 240 volts and distributed to plant electrical equipment. 600-volt Armorlokt was used throughout, in sizes #2 AWG, 2/0, 4/0, 350 MCM, and 500 MCM. Most of it was 3-conductor cable. Armor was galvanized steel. Schlegel manufactures beading fabric for doors on Ford and General Motors cars . . . also makes industrial fabric for other applications.

American Steel & Wire Division of USS **United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

Packaged for Circuit Protection!



All Chance Uniclamps -Parallel Groove Clamps -U-Bolt Connectors -and Hot Tap Clamps are now available in individual plastic packages with z.l.n.100 pre-applied! Clamp stays clean . . . sealing tape reminds lineman to wire-brush and apply z.l.n.100 to the conductor too!

A-B-CHANCE COMPANY

GENERAL OFFICES: CENTRALIA, MISSOURI
(A-B-CHANCE CO. of Canada, Ltd., Toronto)

CC58-8

Furthermore, the heat generated by vacuum tube filaments is the source of many other component failures. This is completely eliminated in the transistorized Motorola frequency shift power line carrier.

The new development has also added to flexibility of the equipment since the equipment can now be operated from a 48 volt battery source as well as conventional a-c power.

Transmitter power input requirements for the new equipment are 22 watts at 117 volts or 11 watts at 48 volts d-c. This compares to a 40 watt requirement in the former part tube-part transistor model.

The equipment is designed to utilize with maximum effectiveness the crowded power line frequency spectrum. Many types of signals, including telemetering, transfer-trip relaying, teleprinting, telegraph, load control, remote control, supervisory control and remote signaling and indication can be transmitted.

For additional data, ask for item U-804, using the coupon on page 119.

600 volt indoor-outdoor current transformer

AN INDOOR-OUTDOOR 600 volt current transformer has been introduced by Sangamo Electric Co., of Springfield, Ill. The Type BH will be built

in standard 200, 400, 600 and 800 ampere ratings, and for the first time at this voltage, with a double range 200/400 ampere ratings.

All ratings will have a continuous current factor of 2, will meet the applicable NEMA standards, and will have a .3 accuracy at Burdens B-0.1 and B-0.2. The 400, 600, and 800 ampere ratings will also be in the .3 accuracy class at Burden B-0.5. A certificate of factory test is supplied with all current transformers.

Smaller and lighter than other models, the Type BH transformer is encapsulated in an epoxy resin which has excellent electrical and mechan-

keep an eye on
SYSTEM VOLTAGE

SANGAMO LINCOLN THERMAL VOLTMETERS

are the key to economical system planning

Utility engineers need reliable information on system voltage to solve present distribution problems—maintain specific voltage levels—anticipate tomorrow's voltage requirements.

Sangamo Lincoln Thermal Voltmeters are the lowest cost means of obtaining accurate, continuous knowledge of the voltage spread at check points throughout your system.

Permanent Installations of Sangamo Lincoln Thermal Voltmeters give you these benefits:

- *Continuous record of voltage conditions*
- *Indication of only "steady state" voltage variations for ease in setting voltage regulators*
- *Economical socket installation*
- *Simple reading—quick resetting*
- *Reduction of expensive service calls*
- *Elimination of costly periodic surveys*

Ask your Sangamo Representative, or write us for full information on Sangamo Lincoln Thermal Voltmeters and other Sangamo equipment for system betterment.

BILL OF MATERIAL

1—V2S* Thermal Voltmeter . $30.74

1—Standard Meter Socket . . . 2.92

*Used where outages are not a problem.

1—V3S† Thermal Voltmeter . $42.34

†Minimum reading not affected by outages.

SM58-A

SANGAMO ELECTRIC COMPANY *Springfield, Ill.*

"X-RAY" VIEW of the SRT, showing the volt-sensitive regulating mechanism at the top of the core-coil assembly and the under-load tap changer at the lower part. SRT's will be available in the following ratings:

2400 volts, 10 through 25 kva
4160 volts, 10 through 37½ kva
4800 volts, 10 through 50 kva
7200 and 7620 volts, 10 through 75 kva
12,000 and 14,400 volts, 10 through 100 kva

L-M Announces the

SRT

THE WORLD'S FIRST

Self-Regulating distribution Transformer

A Revolutionary New Engineering Development That Offers Utility Companies Better Revenue, Better Service To Their Customers

By **A. R. WAEHNER**
Director, Transformer Sales, Line Material Industries

The new L-M Self-Regulating Transformer consists of a Round-Wound® distribution transformer with extra taps on the *primary*, and a regulating mechanism that is volt-sensitive on the *secondary*.

The device switches primary taps, *under load*, to change the transformation ratio as needed to maintain a constant normal voltage to the customer, regardless of line or load changes. The SRT provides 10% of regulation in four 2½% steps.

Better Revenue For The Utility

The SRT is a break-through into a whole new world of customer service and profitable operation, because it corrects the voltage *at the point of use*. By maintaining proper voltage, the SRT prevents the drop in billings caused by *undervoltage*, which in the aggregate can represent a considerable loss.

Improves Service To Customers

With correct voltage, lights are brighter; television sets, clothes dryers, air conditioners, and other electrical devices operate more efficiently; ranges heat faster.

The SRT also prevents *over-voltage* from reaching the user. This greatly reduces burnouts of TV tubes, and of incandescent lamps—the latter a very obvious saving to a utility with a lamp-replacement program.

The SRT is another outstanding contribution of The Thomas A. Edison Laboratories of McGraw-Edison Company.

Features Of The SRT

Adapt-a-Tap Range Selector: The SRT provides a full 20% range within which taps for the 10% automatic regulation in four 2½% steps may be selected—all below, straddle, or all above normal. Thus the SRT can be located anywhere on the line—the end, the middle, or near the substation.

Nominal 3½-Volt Band Width: The midpoint is set, for example, at 120 volts. The SRT changes taps whenever the voltage drops to 118¼ or rises to 121¾. Each operation occurs only after a time delay, which prevents undesirable operation and "hunting" on switching surges and momentary variations outside the band width.

Reliability: One 2400-volt tap changer has now operated more than 250,000 times—equivalent to over 40 years' life on a 25 kva transformer.

Economy: Under normal conditions the SRT will prove more economical than other means of voltage correction. Thus it opens unlimited horizons to the distribution-system planning engineer for more effective design.

Available For Tests

The initial production of the SRT will be sold to progressive companies to explore the benefits, in improved revenue and better customer service, that are available from this outstanding new development. Thus each company can learn, for itself, the extent to which the SRT can make a substantial contribution toward keeping revenue up and costs down.

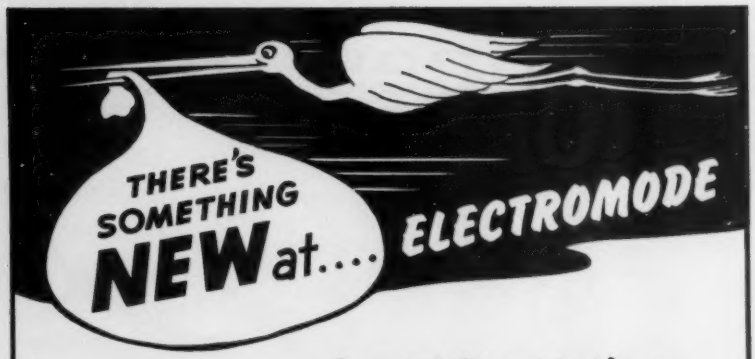
Get The Details

L-M Field Engineers and Apparatus Specialists can furnish detailed information about the SRT. If you would like this information, please get in touch with your L-M Field Engineer, or phone or wire me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

350



C and I Portable Heater

COMMERCIAL and INDUSTRIAL —that's what C & I stands for! And it stands for a whole lot of good qualities, such as quick warmth, cleanliness, and safety. Specifically designed for stores, supermarkets, offices, factory departments, and any area where additional or temporary heat is needed. Adjustable louvers make it so convenient to direct fan-driven heat right where it is wanted. Built-in thermostat automatically maintains desired temperature. Yes, for complete safety it has the Electromode exclusive sealed-in Safety Grid heating element.

*5KW—240 Volts—Single or 3 Phase

RADIANT *Wall-Type* Electric Heater for Bathroom and Small Room

Made in both automatic and manual models, these modern heaters provide an economical way to enjoy clean, healthful, convenient electric heat. Quick, radiant warmth fills the room! Flush type polished **Stainless Steel** grille assures permanent beauty. High polished solid aluminum reflector designed to maintain most efficient heat radiation.

Simplified design permits fast, easy installation. Mounting bars eliminate necessity for framing; also serve to position heater for different types of wall construction. Bars may be easily removed, and there are mounting holes in the flange and sides of wall box for existing construction.

Complete Specifications on these two New Electric Heaters Available Upon Request to:

ELECTROMODE
Division Of
COMMERCIAL CONTROLS CORPORATION DEPT. ES-88 ROCHESTER 3, NEW YORK

ical characteristics for outdoor applications. It has an elliptically shaped opening which combines the advantages of both the round and obround type for accommodating large conductors. A mu-metal core provides the finest accuracy characteristics.

The top surface of the transformer is flat and provides tapped mounting holes for installing a secondary lead duct or channel. A short circuiting device is provided under the terminal cap. The new transformer is available in window-type and flat bar construction.

For additional data, ask for item U-805, using the coupon on page 119.

Control instrument monitors light levels

A NEWLY-DESIGNED version of an illumination control instrument which monitors light levels and signals a

relay to switch lights on or off automatically has just been announced by Weston Instruments Division of Daystrom Inc., 614 Frelinghuysen Ave., Newark 12, N. J.

Designated as the Model 1099 Luminaire Illumination Control, this latest addition to the Weston line of high-accuracy light measuring instruments features automatic positive operation of light switches without regard to time of day, temperature, or weather conditions, with no consumption of electrical power except during a switching cycle of thirty seconds.

The basic Photronic Cell-Sensitrol Relay design has been in successful use for over 25 years, Weston announced, and this new version adds the advantages of compactness and simplified plug-in design to photoelectric reliability and economy. The number of components has been reduced in this latest version, and when replacements are needed, neither recalibration nor adjustment of the control are needed. Operating levels are unaffected by temperature, voltage variations, or aging, and there is no temperature build-up within the control due to self-heating.

Composed of a Weston Photronic

Connect
COPPER with COPPER
ALUMINUM with ALUMINUM
use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2

PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4
6—1 0 A R Cu. 8—1 0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

1525 Woodson Rd. • ST. LOUIS 14, MO. • PHONE: WYdown 3-9430

Ask your

Westinghouse representative

about the exclusive benefits

you get from

URL AND URF

REGULATORS . . .

WITH 1¼%-STEP

REGULATION

Westinghouse URL and URF voltage regulators, with 1¼ % steps, provide improved regulation . . . with a minimum of corrective operations. Here's why:

The "set" bandwidth describes the limits outside of which voltage correction is called for. Since correction stops when voltage is brought back within the band, smaller steps require narrower band settings for the same quality of regulation . . . but narrower band settings require extra tap-changer operations.

Thus, the 1¼ %-step regulation of Westinghouse URL and URF regulators provides an effective voltage that is closer to the balance voltage—the narrowest *effective* bandwidth, with the *fewest* operations.

Call your Westinghouse representative for the complete story about this special quality of regulation—the result of PLOWBACK OF EARNINGS into research to provide better methods for voltage control in your electrical distribution system.

J-70861

YOU CAN BE SURE...IF IT'S Westinghouse

light-gathering cell which continually monitors the light level and generates its own current, and a Sensitrol Relay which is signaled to start the control and operate the load switch, the Model 1099 contains no vacuum tubes, resistors or capacitors which have to be replaced periodically. There is no need to worry about outdoor color temperature, the manufacturer states, since at working levels, the spectral response of the Weston Photronic cell closely approximates that of the human eye.

For additional data, ask for item U-806, using the coupon on page 119.

Voltage, continuity tester has flashlight attached

A TESTING DEVICE combining a voltage tester, a continuity tester and a handy compact flashlight enclosed in an unbreakable case no larger than a regular pack of cigarettes is announced by Cessco Industries, 55 Church St., Albany, N. Y.

Of particular interest to all service and maintenance personnel concerned with testing anything electrical, the flashlight is easily used while testing for Voltage or Continuity. Two 12" test leads are included with the "Meter-Lite."

The Meter-Lite may also be used to test for continuity of high resistance circuits; determining whether power source is a-c or d-c; and, locating ground side of power supply.

For additional data, ask for item U-807, using the coupon on page 119.

Reel winder loads in two directions

THE PENGO Model 6100 torque converter drive reel winder, that loads and unloads reels of wire by power

and turns the reel in either direction, has been announced by Petersen Engineering Co., Inc., Santa Clara, Calif.

This unit was designed for use in conjunction with the PENGO line of tension stringing equipment as a reel carrying dolly and to pay the conductor out over the bull wheels of the tensioner at the pay-out end of a wire stringing operation, and as a reel winder behind the bull wheels of a Pengo bull wheel cable puller at the other end of the operation. Disc brakes are used for providing the necessary slight drag on the reel to

prevent over-run of cable between the reel winder and the bull wheels of the tensioner. The engine is not in use during this period of the operation; the braking action being purely mechanical so as to make for maximum safety, which cannot be achieved if braking is accomplished by power.

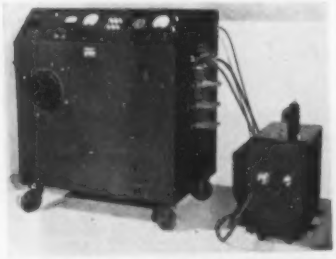
At the pulling end of the line, the engine speed being constant and the R.P.M. of the reel steadily decreasing due to the build-up of the pulling line onto the reel is compensated for by the use of a special PENGO torque converter.

Among the PENGO torque converter's outstanding features are, that it is able to function continually under 100% slippage without overheating; torque is greatest when greatest torque is needed, invariably when slippage is taking place, which is the opposite result obtained with air or hydraulically driven equipment.

For additional data, ask for item U-808, using the coupon on page 119.

Instrument tests wide range of system protective devices

THE MULTI-AMP Corp., 465 Lehigh Ave., Union, N. J., has developed a multiple purpose instrument, desig-



nated Model 2150/48/61-HV, for testing a wide range of utility system protective devices. It's a mobile, low-voltage, high-current 15-kva instrument with auxiliary transformer section rated 40 kv, 5 kva.

For additional data, ask for item U-809, using the coupon on page 119.

Eight relay types described in bulletin

"PROTECTIVE RELAYS," a two-color, 16-page catalog describing the complete line of protective relays manufactured by Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J., is now available.

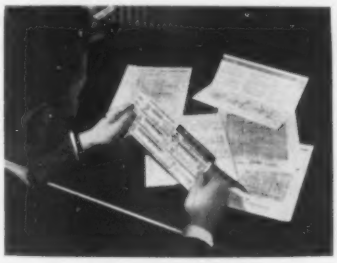
Featured in the catalog are fifteen models of protective relays, representing eight different types. These are: time delay overcurrent relays, directional inverse time overcurrent relays, differential relays, instantaneous overcurrent relays (adjustable setting), inverse time voltage relays, auxiliary relays, AC/DC definite time relays, and reclosing relays.

For each model, descriptive material, tabular data and photographs detail its applications, special features, design, settings, burdens at 60 cycles, contacts, and case.

In addition, the catalog contains an introductory section which reviews the three basic designs used in Federal Pacific relays. Also, there is a section outlining the different kinds of relay cases available.

For additional data, ask for item U-810, using the coupon on page 119.

Unit sub slide rule selects low voltage circuit breakers

A UNIT SUB SLIDE RULE designed to simplify short-circuit calculations and help in the selection and application

of low voltage air circuit breakers is being made available by Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

By means of the rule it is possible to select the proper breakers for a fully-rated, selective or cascaded substation application. The only information needed to assist in this selection is transformer size and primary system capacity.

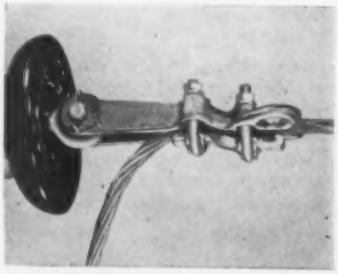
The two-color envelope in which the slide rule is packaged has schematic diagrams and instructions on the application of low voltage breakers.

The unit sub slide rule for selecting air circuit breakers is available on request on company letterhead from Allis-Chalmers.

For additional data, ask for item U-811, using the coupon on page 119.

Dead end strain clamp adaptable to many jobs

A BRONZE dead end strain clamp with greater holding power and easier installation has been added to



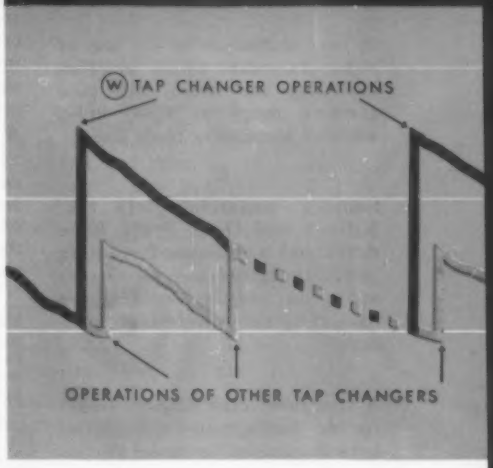
the line of transmission and distribution fittings offered by Anderson

Westinghouse

1¼%-step

regulation . . .

REQUIRES FEWER OPERATIONS, INCREASES CONTACT LIFE



Westinghouse URL and URF regulators with 1¼% steps require 42% fewer operations to maintain the narrowest *effective* bandwidth. This means that:

- Contact life is increased.
- Oil carbonization is reduced.
- Maintenance costs drop.

For better regulation, insist on the total package: 1¼% step, inverse-time relay, instant-response tap changer.

J-70862

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Westinghouse

No. 8 in a series

Right off the Wire

About half of this country has been converted to dial telephones and it is expected that within five or ten years, it will be possible to dial Europe or the Hawaiian Islands.

&

Two new developments in "fiber optics" (the use of glass or plastic fibers to transmit light around curves) are in the examination of the inside of the human body and in cryptography.

&

A new plastic reinforced with silica withstands high temperature better than steel.

&

A new technique in the use of radar antennas which involves sweeping the beam will give them a range of 3,000 miles without increasing their size.

&

Simplex researchers, D. W. Kitchin and O. S. Pratt, have developed techniques for taking photomicrograph movies of polyethylene insulation failures caused by excessively-high voltages.

&

A thermo-electric engine, based on the temperature differential between dissimilar metal plates, converts atomic energy directly into electricity with a thermal efficiency of twelve per cent.

&

A new machine uses the light from atoms of mercury to control the engraving of lines on diffraction gratings which must be less than a wave length of light apart. Accuracy is closer than one-millionth of an inch.

&

The strength of cast iron and resistance to high temperature are combined with good electrical resistance in a new ceramic.

By using a clock based on the vibration of an atom of cesium, it has been found that the length of our day has been increasing half a thousandth of a second per year.

&

A new television picture tube has a front of double glass with mineral oil between. This increases light transmission by reducing reflection.

&

A two-volt booster battery is made to supplement a regular automobile battery. It is used only in starting.

&

Simplex ANHYDREX XX insulation has greater resistance to deterioration at elevated operating temperatures than any natural rubber of GR-S heat resisting insulation.

&

A ramjet power plant for permanent earth satellites has been designed which would obtain its power from the re-combination of oxygen atoms that have been divided by cosmic radiation in the higher altitudes.

&

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

&

An electron tube the size of a shirt button is made of layers of titanium and ceramic. It makes the tube competitive in size with the transistor.

&

An instrument for detecting radiation is said to be so sensitive that it can detect a thousandth of a gram of chromium 51 dissolved in a river.

&

A patent has been issued for a television set that shows two programs superimposed on one screen. The images are separated by polarizing glasses and individual earphones reproduce the sound.

A treatment for metal bearings is claimed to make it possible to run them indefinitely without lubrication. It has also been tested on power press tools.

&

A three-dimensional cathode-ray tube gives a display with a depth of one mile.

&

A steel roller for a new paper mill is said to be the largest in the world. It is over twenty-six feet long and is forty-four inches in diameter.

Submarine cables for railroad use!

Submarine cable is required by the New Haven R.R. for the power and control of 24 movable spans at 14 railroad bridges. Old style steel armored cable suffered the ravages of salt corrosion, strong currents and constant flexing, all of which resulted in high maintenance. Replacements, as required, are made with new Simplex submarine cable, jacketed in fabric-reinforced neoprene — a product of Simplex research — a remedy for delayed service and high maintenance costs.

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Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

Electric Corp., 700 North 44th St., Birmingham, Ala.

This new Anderson clamp is Type BDE. It's a cast, high tensile, bronze alloy, straight line clamp equivalent to the company's Type ADE aluminum clamp, with a wide range of sizes for economical adaptations.

The new BDE bronze dead end strain clamp uses Anderson's exclusive "Snub-Seat" which provides greater holding power, and is equipped with a "come-along" eye for ease in sagging cable with stringing tackle.

The BDE clamp also includes a one-piece keeper with U-Bolts for easily inserting cable, as the U-Bolts are long enough to insert the cable without completely removing nuts. These features are available in all sizes of BDE clamps.

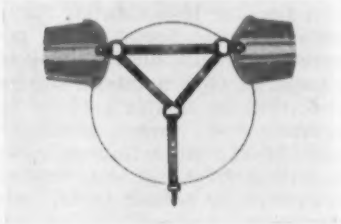
BDE clamps also come with an eye on the keeper piece which lifts the keeper assembly so cable can be easily inserted in hot line work. There's adequate clamp length between the keeper piece and the clevis pin for the conductor to reach through above or below the insulator with plenty of clearance in jumper applications.

Anderson's new BDE clamps come in five sizes with a clamping range of .18 to .98 inches so customers can select the most economical clamp for each particular job.

For additional data, ask for item U-812, using the coupon on page 119.

Safety sleeve harness designed for linemen

WYE MANUFACTURING CO., 300 East Main St., Louisville, Ky., has developed a safety harness for linemen



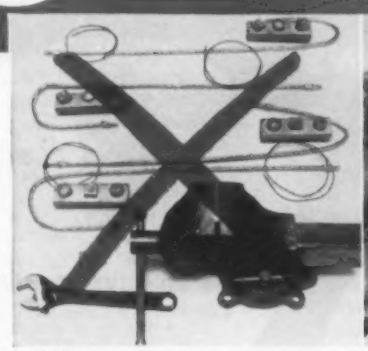
which will assure a brighter, safer future for all those who work around hot wires.

The Wye lineman's safety sleeve harness holds rubber sleeves in correct position for maximum safety and comfort at all times without binding or crawling. This harness is elastic enough to give in all directions to conform to any strain and stretch, yet returns to normal shape when strain is released.

This harness, unlike the old method, cannot crawl up when the arms are in working position overhead nor slide down the back when arms are lowered. Fits any size man, and is as simple to adjust as a belt. It may be worn with any standard type rubber sleeves.

For additional data, ask for item U-813, using the coupon on page 119.

UP TO 49% $AVINGS on materials alone with Fine Fanner Superformed FANN GRIPS FOR DEAD-ENDING GUY STRANDS



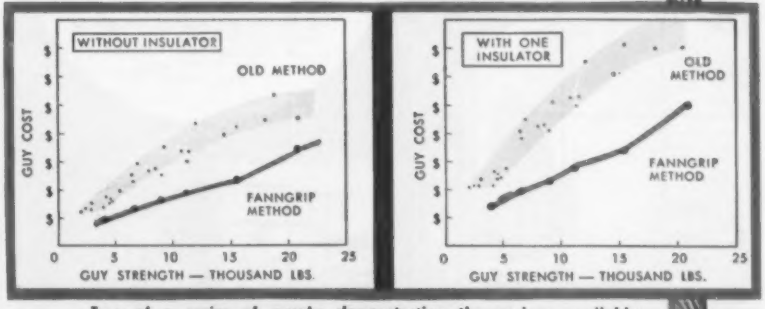
Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

- Provide maximum strand strengths.
- Eliminate laborious field fabrication.
- Self-clamping, permanently tight.
- Heavy coatings protect from corrosion.
- Do not damage guy strand surfaces.
- Dangerous and wasteful strand ends eliminated.
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

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5200 COMBINATION LINE
Complete line of duplex devices in S.P., 3 W, single or separate circuits to fit standard duplex wall plates.
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SPECIFICATION (5000) GRADE
In specifying a Leviton 5000 number, you are assured of getting completely dependable, top-quality Specification Grade devices.
INTERCHANGEABLE LINE
A complete series of flush mounted wiring devices and straight line design wall plates to allow a large number of combinations . . . in one-gang or multi-gang arrangements.
Your best jobs are done with . . .
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Promotion in Arkansas

(Continued from page 21)

heating. They have booths at rural electrical shows and home shows. They supply the names of prospects for electrical heating, and follow through with all necessary help to the contractor.

Said C. F. Cupples, assistant manager: "Our greatest potential for future sales is the older home, a field that is vast and practically uncultivated. Baseboard heating for homes already built got a tremendous boost this year. This summer, for new construction, we're selling ceiling heat. Wall insert heaters are going well also."

Proof that contractors are responding quickly to educational promotions relative to electrical heating, Cupples produced a long list of electrical contractors in small towns who are profiting from electrical heating. A few he named are Glover Electric Co., Lonoke; Nobles, Inc., Hot Springs; Hambuchon Electric Co., Conway; and Jim Lott, Benton. All of these have learned that any electrical contractor can become an electrical heating specialist.

Two-way radio system

(Continued from page 48)

section on the 10 system of code numbers. There are 41 code number combinations including the most familiar 10-4 meaning "acknowledgement, transmission received and understood." Some of the special code numbers include 10-6, "out of service"; 10-7, "in service"; 10-8, "repeat, conditions bad"; 10-11, "work finished"; 10-12, with address, "go to (*location*) and report by radio"; 10-14, "advise weather and road conditions"; 10-16, "what is your location?"; 10-43, with address, "transformer out"; 10-53, with address, "connect service"; 10-54, with address, "disconnect service"; 10-99, "unable to receive your signals."

With all employees using the radio trained in use of the number code and other techniques in brevity and accuracy, operation of the radio system usually proceeds without a hitch. This, together with continuous preventive and sound emergency maintenance techniques, insures a solid return of one's radio investment. Equipment alone is not enough, it must be used and maintained properly like any other piece of precision equipment if it is to return full value.

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ DESPITE the apparent inconsistencies of sections 2321 and 2360 of the Code, we attempted in the last issue to show the intent of these sections and to round up and summarize certain points not previously covered in earlier issues. We propose to complete in this issue our summary of those random sections still remaining which are not always clearly understood. In doing so, we will complete our discussion of services for voltages up to 600 volts.

Section 2352 lists the connections permitted ahead of the service disconnecting means, and section 2375 lists the connections permitted ahead of the service overcurrent device. Each lists the other so that either the overcurrent device or the switch may come first as desired. We have already discussed the relative arrangements permissible for these two devices in relation to meters in an earlier issue. This leaves time switches, surge protective capacitors, instrument transformers, lightning arresters, and emergency systems for lighting, power, fire pumps, sprinkler and alarm systems.

No explanation is needed for the lightning arresters and the surge protective capacitors, except possibly to call attention to the overcurrent devices and the disconnecting means required for such capacitors by sections 4607-b and 4607-c. Neither is an explanation needed for instrument transformers, except that care must be used to prevent confusion between the instrument transformers permitted by sections 2352 and 2375-b and the meter current transformers which have the prohibitive clause in section 2375-e limiting the voltage. Explanations are in order, however, for the remaining connections permitted ahead of the service disconnecting and overcurrent protective devices.

The reference to time switches, for instance, pertains to a particular kind of time switch, the function of which is to control the service or a part of the service in question, such as the time switch controlling an electric water heater which is connected to a separate meter because of a rate differential. These time switches must be provided with separate discon-

Code test questions:

1. Service conductors shall be connected to the line side of the service disconnecting means with soldered lugs. True or false?

2. The service disconnecting means shall simultaneously disconnect all conductors from the supply. True or false?

3. A knife-blade type service switch shall be totally enclosed in such a manner that it cannot be operated without first opening the cover of the enclosure when installed where accessible to unqualified persons. True or false?

4. A service switch installed in a Class II Division 1 location as defined in Article 500 of the Code is not required to be of the explosion-proof type as this term is defined in Article 100. True or false?

5. The term "a set of fuses" means all the fuses required to protect all the ungrounded conductors of a circuit. True or false?

6. In a property consisting of several buildings under single management, the conductors supplying each building served shall be:

(a) protected by overcurrent devices which may be located in another building on the same property if accessible to the occupants of the building served.

(b) protected by a minimum of six disconnecting means.

(c) Type TW if run in underground conduits.

Which is correct: a? b? c?

7. The service overcurrent device:

(a) may be located at the outer end of the service raceway.

(b) is required to be an integral part of the service disconnecting means.

(c) shall be based on the total connected load before demand factors are applied.

Which is correct: a? b? c?

8. Branch-circuit overcurrent devices shall be:

(a) mounted adjacent to the service disconnecting means.

(b) of the type which can be locked in the open position.

(c) mounted in an accessible location if the service overcurrent devices are locked.

Which is correct: a? b? c?

9. An automatic overcurrent device protecting service conductors supplying only a special load, such as a water heater:

(a) shall be of the indicating type.

(b) may be locked or sealed if necessary to prevent tampering and if located so as to be accessible.

(c) shall be actuated by a time switch.

Which is correct: a? b? c?

10. If a service run of rigid metal raceway is interrupted by flexible metal conduit, the sections of rigid metal raceway thus interrupted shall be bonded together by a copper conductor not smaller than:

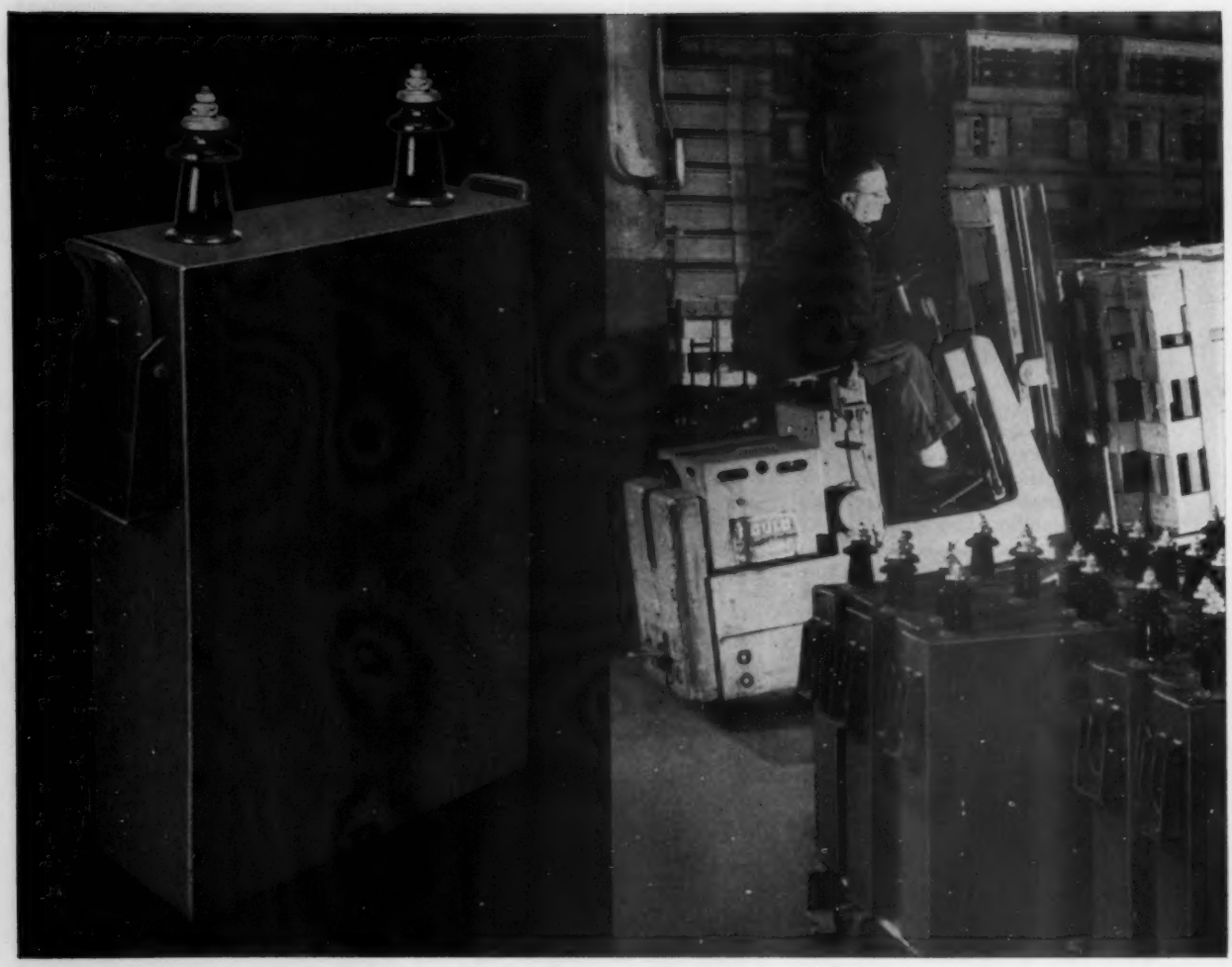
(a) No. 6.

(b) No. 8.

(c) No. 4 if stranded and No. 6 if solid.

Which is correct: a? b? c?

Answers will be found at the end of this article. *(See page 115)*



Another product of Plowback of Earnings into research

100-Kvar Capacitors Now Ready for Shipment

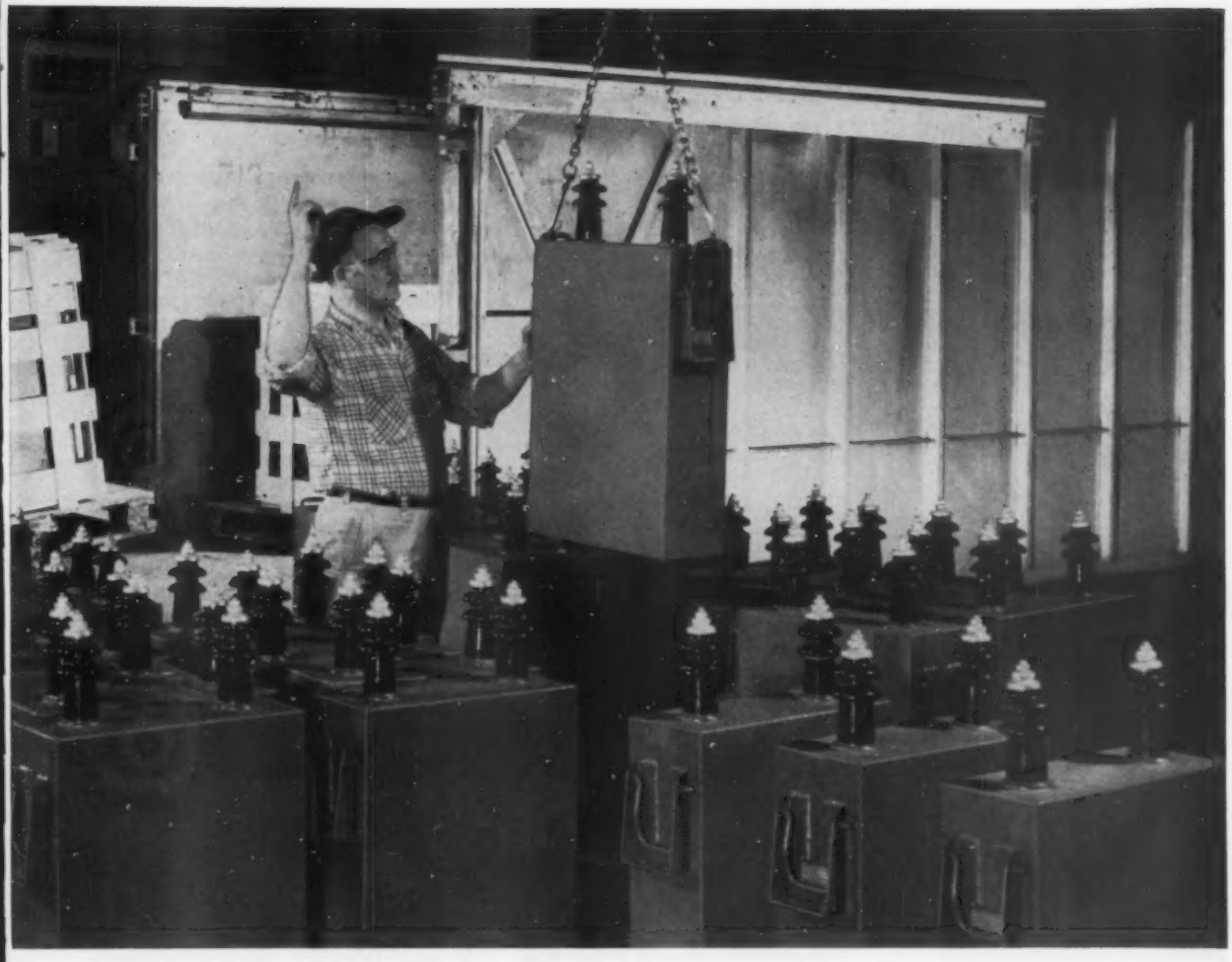
Anticipating the industry's need for larger blocks of reactive power, Westinghouse engineers developed this new 100-kilovar capacitor to boost kvar output per unit . . . *more economically* and conveniently than ever.

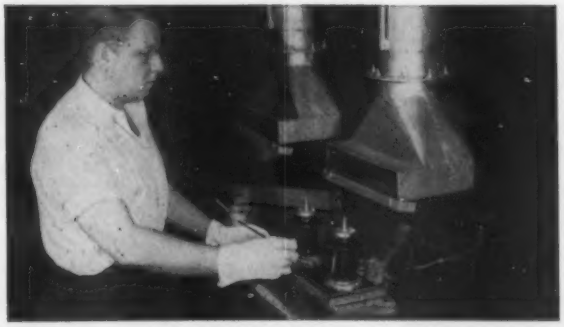
These units are in regular production, and shipments are being made to meet the tremendous demand expected for this new product.

Following the long-established policy of reinvestment of earnings for research, these new capacitors feature the high quality and outstanding performance always associated with Westinghouse capacitors. Continual testing during assembly assures top reliability . . . after years of service.

For complete information about the new 100-kvar capacitors and the way they can save you money, call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60951





Solder-sealed bushings assure hermetic seal. Complete freedom from leaks or contamination of dielectric is assured. Wet-process porcelain bushings give maximum strength and excellent insulation value.

Zinc spray finish guarantees maximum protection. A lifetime corrosion-resistant coat of metallic zinc, sprayed on to a minimum thickness of eight mils, insures unparalleled case life under the most adverse conditions.

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IT PAYS TO HAVE HUBBELL QUALITY CONNECTIONS

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presSwitch

Quality... you can put your finger on

Introducing "Presswitch," the revolutionary new Hubbell press-type A.C. switch . . . a press,it's on; a press,it's off . . . the smoothest, most convenient and most efficient A.C. switch in Hubbell's famous switch family. "Presswitch" responds to the gentlest press or touch of the finger or nudge of the elbow. It is as much at home in a factory as in a living room. Its attractive styling blends with any interior and its rugged, precision molded construction represents a new standard of durability and dependable operation.

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necting means and overcurrent devices, and the conductors tapped ahead of the service equipment to serve them must comply with the Code requirements for service conductors.

Emergency systems

This leaves the various emergency systems which may be connected ahead of the service equipment, and these are the connections which seem to be the least understood. Two questions in regard to these systems invariably are asked:

(1) Are the emergency system disconnecting means required to be grouped with the normal service disconnecting means?

(2) Does the limitation of six service disconnecting means and six sets of service overcurrent devices mean a total of six *including* or *excluding* the emergency system, and if excluding the emergency system, is the emergency system itself limited also to six?

Both of these questions are clearly answered by sections 7014 and 7015. Article 700 which governs the installations of emergency systems permits a separate service for emergency requirements, and a sub-service ahead of the disconnecting means. Section 7014 of this Article describes the requirements for the two separate services as follows: "Two services, each in accordance with Article 230, widely separated electrically and physically to minimize possibility of simultaneous interruption of supply." Section 7015 similarly describes the requirements for a sub-service tapped ahead of the service equipment as follows: "Connections on the line side of the main service if sufficiently separated from main service to prevent simultaneous interruption of supply through an occurrence within the building or group of buildings served."

Must be separated

Hence quesiton #1 is answered in the negative. In fact, the emergency disconnecting means and overcurrent devices are not only permitted to be separated from the normal service equipment, but they are *required* to be both *electrically* and *physically* separated as *widely as possible.*

Question #2 is answered by reference to Article 230. If installed in accordance with Article 230, then the emergency system is itself limited to six disconnects and overcurrent devices by the same rules in Article 230 which

limits normal services to six. In the same reference, the emergency supply conductors are required to be treated as, and installed in accordance with, the same rules as those governing normal service conductors. Sections 2352 and 2375-c and d require that such systems be provided with separate disconnects and overcurrent devices when connected ahead of the normal service equipment.

Mandatory rule

A misunderstanding could arise, and often does, from the wording used in section 2354 which uses the term "may" instead of the mandatory term "shall" in stating the types of service disconnecting means permitted. This permissive term is in no way intended to imply that none of the provisions of this section are mandatory. That part is intended to be mandatory which stipulates characteristics, and only that part indicating a choice between switches and different types of breakers is meant to be permissive.

(Continued on page 114)

Code interpretation changes wiring rule

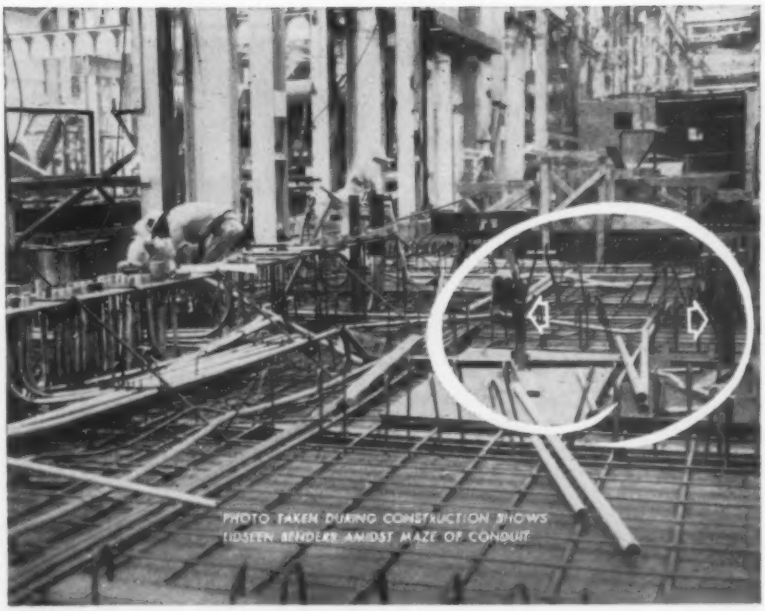
◆ OUR ANSWER to question No. 2 on page 100 of the April, 1958, issue under the heading, "Questions On The Code," must be altered in the light of Official Interpretation No. 450 issued in April, 1958, after ELECTRICAL SOUTH had gone to press. Official Interpretation No. 450 is as follows:

"STATEMENT:—12 single pole circuit breakers are equipped with handle ties or have the handles of adjacent breakers close enough so that six disconnects result. These six disconnects control six three-wire, 120/240 volt branch circuits.

"QUESTION:—If the three-wire branch circuits are divided into twelve two-wire branches at the service by the provision of twelve instead of six connections on the neutral plate or bus, would this be in accordance with the intent of paragraph a of Section 2351?

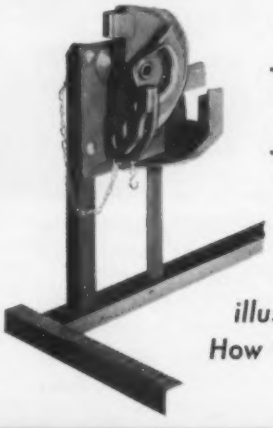
"ANSWER:—Yes."

Since the above is an Official Interpretation, it has the same status as any part of the Code and is *the Code*. I should like to offer the following comments, however, in an effort to relate this interpretation



LIDSEEN "Chicago" Benders on the job during construction of $200,000,000 Kaiser Aluminum Plant

By assisting the Foothill Electric Company, the Lidseen "Chicago" Pipe Bender played a vital role in the installation of this huge, complex electrical system of the new Kaiser Aluminum Reduction Plant and Rolling Mill. Being the largest single industrial development in West Virginia it required about 2,000,000 pounds of conduit and over 5000 precision bends. Over 30 lineal miles of aluminum conduit alone was used. The Lidseen bender is and proved to be a real on-the-job tool . . . it's rugged, has ideal working height, gives accurate bends every time . . . no strain, slipping or loose parts to worry about. Ask the electrician who is using one; he will tell you it's the finest tool available and at a price that is eminently reasonable.

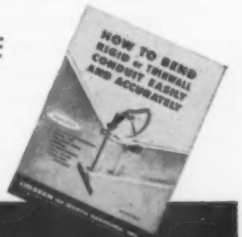


BENDING CIRCLES: INSIDE RADIUS

	No. 1	No. 1T
½" conduit or pipe	2"	EMT 3"
¾" conduit or pipe	4⅛"	EMT 4½"
1" conduit or pipe	5⅜"	EMT 6½"
	No. 2	**No. 2T**
1¼" conduit or pipe	7¼"	EMT 9½"
1½" conduit or pipe	8¾"	EMT 10½"

Illustrated: No. 1 for bending ½", ¾" and 1" rigid conduit

Write for FREE illustrated Folder on How to Bend Conduit



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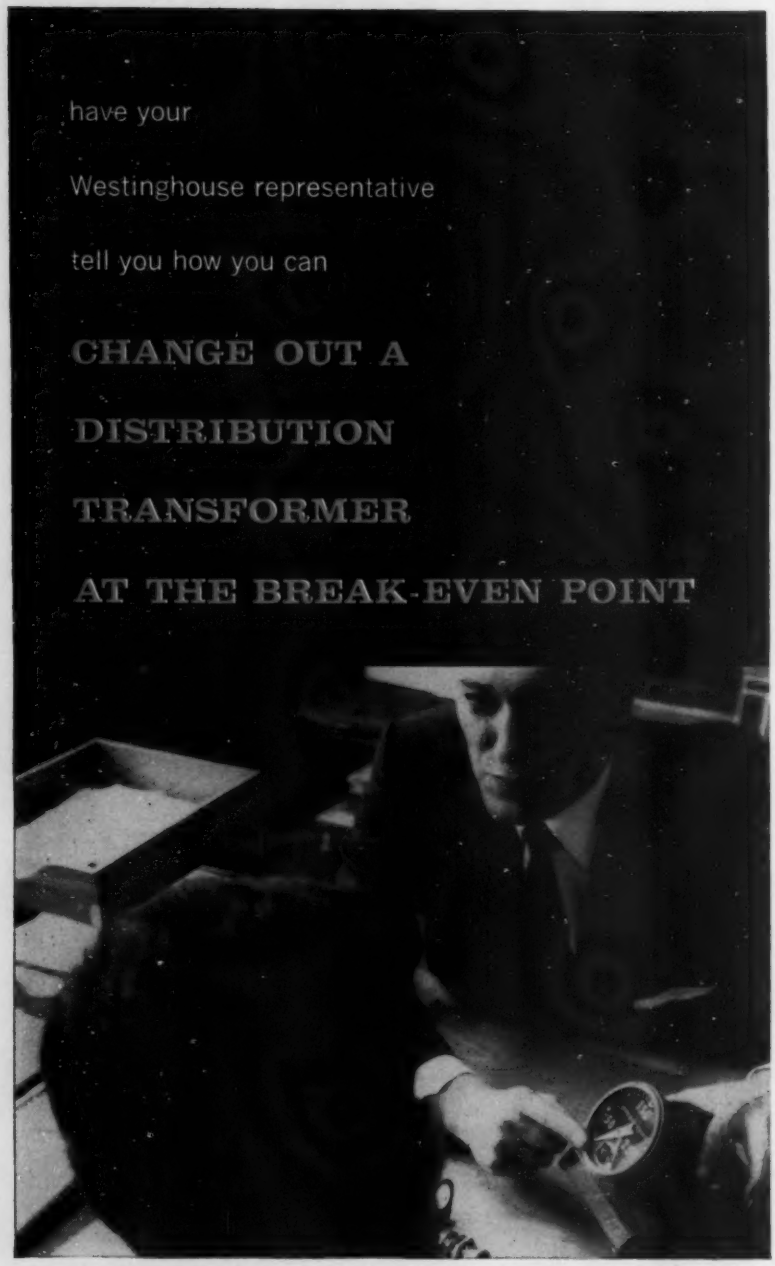
OF NORTH CAROLINA, INC.
1020 FIRST STREET, HAYESVILLE, NORTH CAROLINA
PHONE HAYESVILLE 2000



Now—an indication to show when the loading on a pole-type distribution transformer has reached economical change-out point on conventional or protected units . . . Another answer to meet a changing need—made possible because Plowback of earnings into research maintains Westinghouse leadership in distribution transformer development.

J-70847

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to other sections of the Code as it is now written:

Section 2111 clearly defines a multi-wire branch circuit as follows: "A multi-wire branch circuit as referred to herein is a circuit consisting of two or more ungrounded conductors having a potential difference between them, and an identified grounded conductor having equal potential difference between it and each ungrounded conductor of the circuit and which is connected to the neutral conductor of the system."

Notice that this refers to *an* identified *conductor* (meaning one). Notice also that it mentions the difference in potential between *it* and each ungrounded conductor, not between *them*. ("It" means one).

The part of section 2351-a to which interpretation No. 450 applies states, " . . . Two or three single pole switches or breakers, capable of individual operation, may be installed on *multi-wire* circuits, one pole for each ungrounded conductor, as one multipole disconnect (where applicable, see Section 2353) provided they are equipped with 'handle ties,' 'handles within 1/16 inch proximity,' a 'master handle,' or 'other means' making it practical to disconnect all conductors of the service with no more than six operations of the hand. . . " (Italics added to call attention to the fact that only *multi-wire* circuits were included).

Figure 1 represents two 2-wire circuits. These two ungrounded conductors each with a separate ungrounded neutral, or a total of two neutrals for the two circuits, does not conform to the definition of a multi-wire circuit as defined in section 2111.

Figure 2 represents a connection which is not good practice, in my opinion, for the reasons given in the April, 1958, issue of ELECTRICAL SOUTH. By this, I mean that it is not good practice to tie these two breakers together as a multi-wire

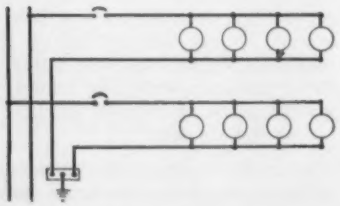

Fig. 1—Two 2-wire circuits—not a multi-wire circuit.

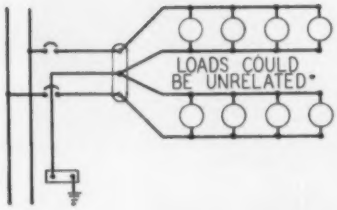

Fig. 2—Two 2-wire branch circuits combined into a single 3-wire circuit from junction to panel. Common neutral in "home run" is logical, but when breakers are also combined it constitutes a handicap since unrelated loads would be controlled by single operation of breakers.

circuit. There can be no harm in using the common neutral from the junction to the panel with a 3-wire home run. On the other hand, if the breakers are combined to operate as a single unit on two unrelated loads, it becomes impossible to turn off one of the two-wire branches for repairs, etc., without also turning off the other 2-wire load. Hence, it is poor practice to combine the breakers merely for the sake of reducing the number of disconnects in order to eliminate the use of mains. However, since this practice is not uncommon, I cannot help but feel that this is what may have been intended by interpretation No. 450.

Figure 3 represents a 3-wire circuit which has two ungrounded conductors with a potential difference between them, and which has

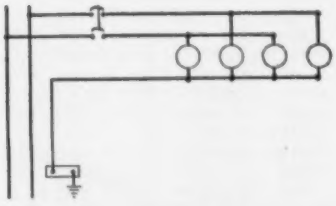

Fig. 3—Connection for a normal 3-wire (multi-wire) branch circuit.

an ungrounded neutral conductor with equal potential difference between it and each ungrounded conductor. It is, therefore, a multi-wire circuit as defined in section 2111.

Figure 4 is a diagram showing graphically what is literally stated by Official Interpretation No. 450 as being a permissible intent of section 2351-a of the Code. Here

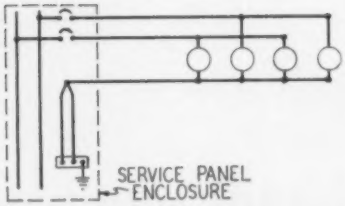

Fig. 4—Illustration of literal text of Interpretation No. 450. (See text.)

we have a normal 3-wire circuit which, we are told, we can convert into two 2-wire circuits at the service by doubling the number of neutrals. (The conversion from 6 neutrals to 12 neutrals was given as an example).

The reason for this conversion from 3-wire to 2-wire circuits escapes me completely. Not only is it beyond my comprehension why anyone would *want* to do this, but it is not clear to me where the conversion would be made. Would it be a matter of splicing two neutrals to every one where these neutrals enter the service panel? Or would the splicing be done at a junction box so that two neutrals could be brought home for each one up to the point of the junction?

I cannot quite grasp how two neutrals for each two ungrounded conductors can be construed to comply with the definition of a multi-wire circuit as defined in section 2111. Nor can I understand how two neutrals, size No. 14 or No. 12, can be connected in multiple, or parallel, without conflicting with section 3105 which does not permit conductors smaller than size 1/0 to be connected in multiple.

These are the things that make me wonder if the connection shown in Figure 2 could have been what the Interpretation Committee had in mind instead of the connection represented by Figure 4. But all we have to go by is what the interpretation *says*. And to me it says the same thing that is shown graphically in Figure 4.

In any case, we feel that, in the light of Interpretation No. 450, we should change our answer from "No" to "Yes" for the correct answer to the question raised in the April, 1958, issue: "Is it permissible to connect two single pole breakers together with handle ties as a multi-wire circuit when each has its own separate neutral if the breakers are connected to opposite phases?"

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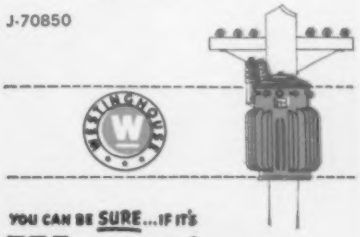

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RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST Corrosion
EQUIPMENT USED Salt Fog Chamber
SPECIMEN NO. 10
TEST STARTED 3/24/58 9 a.m.
TEST TERMINATED 5/23/58 2 p.m.

Most metallurgists and product design engineers are aware that laboratory corrosion tests have relatively little quantitative significance in terms of predictable service life. The only valid conclusion which may be drawn from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.

Nevertheless, corrosion proof-testing is considered an essential phase of product quality control at the Preformed Research and Engineering Center. In addition to conventional raw material quality control procedures, observations of relative corrosion rates are also made on finished products. As an example of objective performance standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled laboratory conditions. Periodic inspections are also made of field test specimens installed at locations throughout the country which are considered to be representative of extreme marine and industrial contamination. This constant laboratory and field surveillance has undoubtedly been largely responsible for the fact that there has never been a report of a Preformed Guy-Grip dead-end having failed in field service due to corrosion.

Jon R. Ruhlman, Vice President
Research and Engineering

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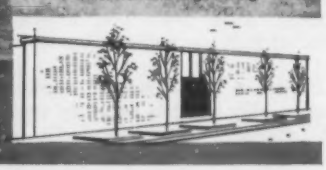
*Made in accordance with or for use under Patent No. 2,761,273; other patents issued and pending.



New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

GUTTER SQUARE DUCT ON WOOD
STRAIGHT THROUGH 2' LTG. & 90 DEGREE ELBOWS EACH

DUCT SIZE ITEM	HOURS	LABOR COST INSTALLED EACH AT FOLLOWING RATES $1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
2½"x 2½"	.70 - 2'	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
4"x 4"	.70 - 2'	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
6"x 6"	.81 - 2'	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
		HANGERS										
2½"x 2½"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
4"x 4"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
6"x 6"	.59	.74	.89	1.03	1.18	1.33	1.48	1.62	1.77	1.92	2.07	2.21
		JUNCTION BOXES										
2½"x 2½"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
4"x 4"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
6"x 6"	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23
		TROUGH COLLARS										
2½"x 2½"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
4"x 4"	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
6"x 6"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
		TELESCOPE FITTINGS										
2½"x 2½"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
4"x 4"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
6"x 6"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
		T - FTG'S & PULL BOXES										
2½"x 2½"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
4"x 4"	.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45
6"x 6"	.97	1.21	1.46	1 70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64

E-107-B

LABOR: INCLUDES HANDLING, LAYOUT, DISSASSEMBLY, SECURING TO BACKING BOARD, REASSEMBLY AND SECURING COVER. (ADD TIME FOR MAKE-UP OF TAPS).

8-58

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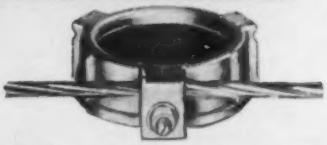
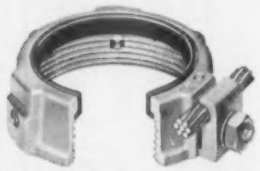
3 Type "BL" — Combines protection of insulated bushing and means for making quick, positive ground connections. Consists of Type "B" equipped with combination lug. Sizes: ½" to 6".

7 Type "E" — For spacing and individually insulating wires as they emerge from conduit. Molded canvas Bakelite covers have high dielectric and mechanical strength. Sizes: ½" to 6".

GROUNDING BUSHINGS



8 Type "GB" — Corrosion-resistant bronze. Ideal for grounding banks of conduit where metallic-protected cable is used. Sizes: ½" to 6".



9 Type "IGB" — Similar to "GB" except insulated with Bakelite collar locked into bushing. Sizes: ½" to 6".

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O.Z. holds the line on quality — with the line that gives you greatest selection!

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4 Type "SB" — For use on conduit having no threads. Case-hardened cup-point set screws for fastening. Sizes: ½" to 6".

5 Type "SBT"—A cadmium-plated bushing for thin-wall conduit application. Fastens with case-hardened, cup-point set screws. Sizes: ½" to 2".

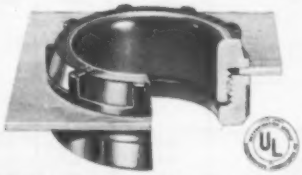
END BUSHINGS

6 Type "EL" — Provides the protection of end fittings and permits quick, positive ground connection by means of combination lug. Sizes: ½" to 6".

INSULATING BUSHINGS

10 Type "A" — Made of molded canvas Bakelite having high dielectric and mechanical strength. Sizes: ½" to 6".

11 Type "BB" — Molded Bakelite. Male thread. Installed with locknut. Insulates cables passing through metal boxes or troughs. Sizes ½" to 6".



12 Type "ABB" — Combination of Type "A" and "BB" bushings to insulate cables passing through metal boxes or troughs. Sizes: ½" to 6".

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GUTTER SQUARE DUCT - ON CONCRETE
STRAIGHT TROUGH 2' LTG. & 90 DEGREE ELBOWS EACH

DUCT SIZE ITEM	HOURS	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
2½"x 2½"	.70 -2'	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
4"x 4"	.70 -2'	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
6"x 6"	.81 -2'	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
		HANGERS										
2½"x 2½"	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
4"x 4"	.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45
6"x 6"	1.1	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
		JUNCTION BOXES										
2½"x 2½"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
4"x 4"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
6"x 6"	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23
		TROUGH COLLARS										
2½"x 2½"	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40
4"x 4"	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
6"x 6"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
		TELESCOPE FITTINGS										
2½"x 2½"	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40
4"x 4"	.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40
6"x 6"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
		T - FTG'S & PULL BOXES										
2½"x 2½"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
4"x 4"	.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45
6"x 6"	.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64

E-107-B

LABOR: INCLUDES HANDLING, LAYOUT, DISSASSEMBLY, SECURING TO BACKING BOARD, REASSEMBLY AND SECURING COVER (ADD TIME FOR MAKE-UP TAPS).

8-58

COMBINATION CONDUIT HANGERS - FOR ONE PIPE ON WOOD

CONDUIT SIZE	MRS. EACH	LABOR COST EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1 1/4"	.57	.48	.58	.65	.74	.85	.95	1.02	1.11	1.20	1.30	1.39
1 1/2"	.42	.53	.65	.74	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58
2"	.47	.59	.71	.82	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76
2 1/2"	.55	.66	.80	.95	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99
3"	.58	.75	.87	1.02	1.16	1.31	1.45	1.60	1.74	1.89	2.03	2.18
3 1/2"	.65	.79	.96	1.10	1.28	1.42	1.58	1.75	1.89	2.06	2.21	2.36
4"	.68	.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04	2.21	2.38	2.55
		FOR ONE PIPE ON CONCRETE - DRILLING BY HAND										
1 1/4"	.74	.93	1.11	1.29	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
1 1/2"	.74	.93	1.11	1.29	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
2"	.84	1.05	1.26	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15
2 1/2"	.84	1.05	1.26	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15
3"	.84	1.05	1.26	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15
3 1/2"	1.10	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
4"	1.3	1.65	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88

E-102-B

LABOR: Includes material handling at site, drilling for anchors and securing anchor bolt or screw as required.

8-58

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BREEZE BUILDER*
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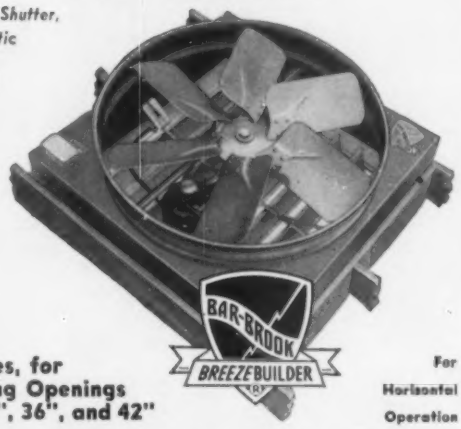

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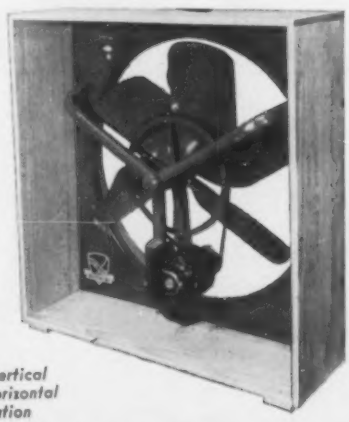
For Horizontal Operation

The BAR-BROOK AVP is a TRUE Package Unit.

Installation time is measured in *minutes*. Fan, shutter, suction box, precut ceiling trim are all one unit. Fan is already wired to motor and safety fuse link. Contractors say it's the easiest fan on the market to install. UL Approved.



Six Sizes:
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42"
48"
54"

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THERE IS A DIFFERENCE IN FITTINGS

Precision Beveled Edges
Exclusive Pre-Set-STAKED Screws!
No Backing Out for Conduit!
Heaviest Gauge Wall Thickness
New Extra Heavy Duty Precision Locknut

EVERY SIZE FITTING through 2"

ETP Connectors & Couplings Preferred & Proven by Electrical Engineers!

- Concrete tight! U.L. File Card E24788.
- One piece solid tubular steel — cannot open or spread. Sized for uniformity. Far surpasses U.L. requirements.
- Precision rolled thread for 54% greater stripping strength—66% greater snapping strength.
- Lustrous zinc, heavy plated finish.
- Available in ½", ¾", 1", 1¼" and new 1½" & 2" sizes.

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ELECTRA
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Complete Warehouse Stock Carried

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CONNECT WITH ETP FOR ECONOMY

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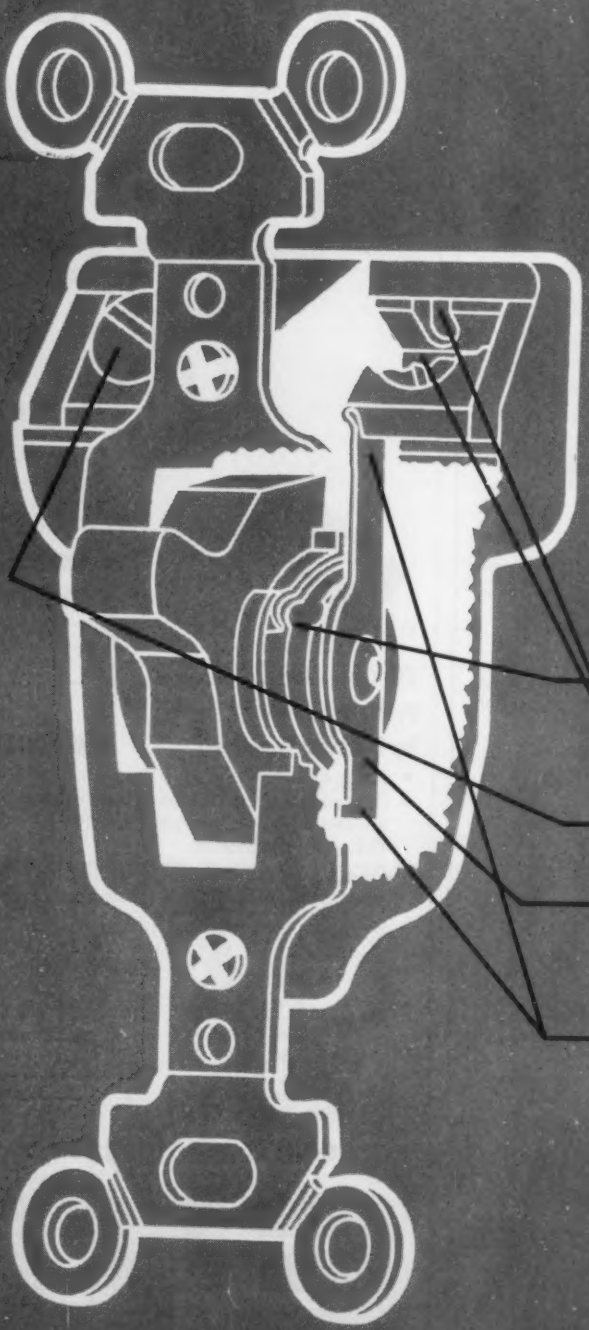
Write for free samples and brochure

ELECTRIC TUBE PRODUCTS
74-16 Grand Avenue, Maspeth (N.Y.C.), N. Y., DEfender 5-8000

SEE THE REDESIGN...



ANOTHER FINE PRODUCT FROM THE NEW

LISTEN TO THE SILENCE...

NOW SHOW THEM WHY... WITH THIS 10-SECOND BRYANT SALES DEMONSTRATION

The first specification-grade Mercury Switch ever available

No Call-Backs with this newly designed Bryant Mercury Switch—

Look at these features:

1. "Snub-type" stop insures ultimate in quietness. This wedge action stop eliminates plate contact with toggle handle and noise due to positive stopping of switch toggle.
2. Top or back wiring or combination of both.
3. 45° angle wiring surface for easy accessibility.
4. Exclusive Bryant feature insures positive pressure between toggle and mercury button. Eliminates slippage between the two when handle is actuated.
5. Contacts are double-bridged for more pressure on mercury button. This makes for cooler operation and longer life.

Available with glow handle; no more groping or stumbling in the dark.

Available in single-pole, double-pole—3-way or 4-way with brown or ivory handle. (Catalog Numbers 4701, 4702, 4703 and 4704.)

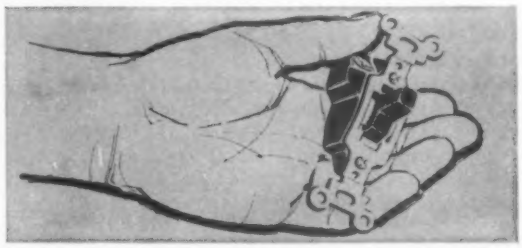
Capacity of 15 amp, 120 volts a-c . . . no need to derate for tungsten or fluorescent loads. J-99011

BRYANT

THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut · Chicago · Los Angeles

"Here are a couple of switches. They both work, but . . ."



"There's a difference. With a Bryant Mercury Switch you not only have the smoothest, quietest switch made—but one that will keep on giving you silent, trouble-free service for many years."

"Here's why. Inside this Bryant switch there's a mercury capsule no bigger than this. That's why this Bryant switch operates so smoothly and silently. There are no mechanical contacts to wear out or burn from arcing."

"The most important thing is that the mercury button and the complete switch have been through the most rigid tests before Bryant will release them to you. And when you buy Bryant, you're buying the best. You know that."

Contractors tell how

Hazards of underbidding

By Benjamin Zarin

Master Electrician
Zarin Electric Company
Washington, D. C.

◆ I BELIEVE it is necessary for all of us in times like these to take an objective look at ourselves and reappraise our performance. In periods of severe competition and ever-rising operating costs, we tend to forget in our eagerness to contract a job, that we have standards of materials and workmanship to maintain, that unless we uphold those standards, we will cut the ground from under our own feet.

We all know that estimates on a particular job vary slightly from one contractor to another. A submitted estimate among three or four varies a few dollars more or less than others. However, more recently we have run into a job where a series of estimates by different contractors was undercut by one contractor perhaps by $100 or $150 or even more on a $500 job.

Someone is cutting corners to make a fast buck; someone is lowering his standards to get a job. You and I know that it is impossible to turn out a job estimated at around $500 for $350. Someone is supplying sub-standard materials and sub-standard workmanship.

I think we all agree that we are entitled to asking and getting a fair price for our jobs. We are entitled to making a legitimate profit. The contractor who quotes $350 on a $500 job estimate by competing contractors is figuring on making a profit but will meet only the most minimum standards set up by the Code.

We need for our own survival an educational campaign for contractor responsibility to the customer, the supplier and even to himself—if we are not to end up competing with the jackleg trade.

We have a responsibility to the customer for an honest, efficient and safe job; we have a responsibility to our suppliers in presenting and using their quality products when we say we do and not substituting with cheaper off-brand items. Moreover, we have a responsibility to ourselves and our profession. We will only create chaos if we relax our standards and compete on price. Then none of us will be able to stay in business.

"We have a responsibility to the customer, to the manufacturer, the supplier and to ourselves," says Benjamin Zarin of Zarin Electric Co., in Washington, D. C.

Rolling shops cut overhead, increase production for electrical contractors

◆ VIRTUALLY UNLIMITED field mobility, resulting in more work done with fewer tools and significantly lower overhead, has been an underlying factor in the rapid rise of many electrical contracting firms.

One contractor, for example, began field tests five years ago on what was then an entirely new approach to the tooling and implementation of electrical construction. The firm supplemented its conventional pick-up trucks with a forward control parcel delivery type unit with walk-in body. It offered tremendously augmented load space plus a variety of other significant advantages.

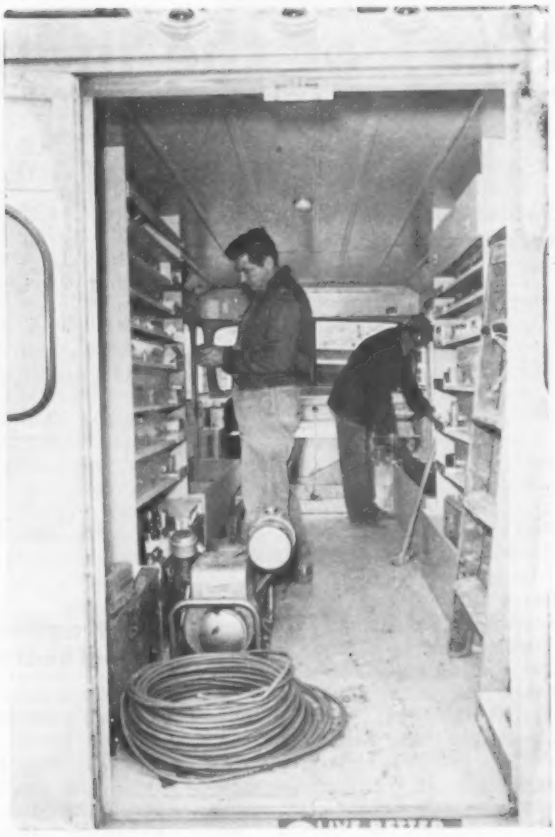
The truck was outfitted with drawers, bins and shelves capable of carrying a wide variety of supplies and equipment including fittings, switches, nipples, junction boxes, extension cords and other items. It was found that the unit could easily haul a power-driven threading machine, welder, drills and saws. These were powered by a portable gas motor generator, also carried in the truck.

In a short time, this electrical contractor discovered that this new truck offered almost unlimited field mobility. It could carry enough basic equipment to each job to eliminate trips back to the warehouse. It could pack up quickly and be off to another location with a minimum loss in time. Equally important, in the case of unexpected bad weather, some work could proceed within the spacious center aisle of the truck itself.

Five years of constant use under every conceivable condition proved that this new approach was the answer to a host of problems. Another unit was added in 1957.

Both trucks are mounted on Ford forward control chassis with 12 foot Merchandiser bodies manufactured by the Boyertown Auto Body Works, Inc., Boyertown, Penna. Each has a sturdy roof rack which holds an assortment of lad-

Mobile workshops carry crews to 2 to 6 men quickly into new housing developments, with complete tool facilities to proceed with house wiring. Gas motor generator (foreground) provides power for threading machine, welder, drills, saws and other tools.



Men work inside efficiently organized truck with drawer-bins, seat-tool boxes containing electrical tools, fittings and fixtures. Ample room is available for conduit, cable, motor generator and special equipment needs for all jobs.

ders and extensions. Where the trucks may be driven under an overhead installation, work may proceed directly from the roof of each unit. The erection of flood lights for parking lots, recreation grounds and storage areas can be quickly and easily completed from this roof rack atop the mobile shop.

"A more economical operation—more work accomplished with fewer tools," is the contractor's praise of his rolling shop system. "The tools are with the truck instead of some being scattered at every job."

The two Merchandiser Units, operating with an average service crew of 6 to 8 men each, are in constant operation on various jobs throughout an area encompassing two states. The company is noted for its electrical work on new home developments and public schools as well as commercial and industrial installations.

Significant of recent progress made by the 56-year-old firm is the fact that since 1957 the firm has occupied its own modern quarters including a complete materials warehouse with garage facilities for its truck fleet.

Do-it-yourself wiring fad presents electrical problems

By R. Albert

Former Electrical Inspector
Washington, D. C.

◆ THE DO-IT-YOURSELF trend has been gathering momentum in every phase of home repairs over the last few years to the point where a home owner is now encouraged to try wiring jobs about his home. In the handyman columns of the real estate sections in the daily and Sunday newspapers it is not uncommon these days to read how easy it is to add another outlet to a living room or wire the newly enclosed porch.

The uninformed home owner who has just saved a few dollars screening his porch thinks he can now proceed to wire the house for air conditioning! It's easy! Didn't the writer in the newspaper say

(Continued on page 110)

News of the industry

edited for Southern readers

South Central Section formed by AIEE

THE BOARD of Directors of the American Institute of Electrical Engineers has authorized formation of District 13, the South Central District, and has named C. P. Knost, of New Orleans, La., as the district vice-president.

The District was formerly a part of District 4, the Southern District of AIEE. The new District, bringing the total to 13 in this country and Canada, includes the states of Kentucky, Tennessee, Mississippi, Alabama and the Baton Rouge and New Orleans Sections of Louisiana.

Mr. Knost is district manager for the Moloney Electric Company. He is a native of Pass Christian, Miss., and attended Mississippi State College and completed a two-year college engineering course at Westinghouse Electric and Manufacturing Company, now Westinghouse Electric Corp. and then did electrical work for copper mining companies for five years. After service with the Army during World War I, he was with Westinghouse for 17 years. He has been Moloney district manager in New Orleans since 1936.

Mr. Knost has been active in AIEE for many years and was the 1942-43 chairman of the New Orleans Section. He initiated and helped develop subsections at Baton Rouge and Shreveport, La., and Jackson, Miss. Shreveport and Jackson have subsequently become sections. He was a director of AIEE, 1950-51.

Electromode announces school heat campaign

ELECTROMODE has initiated an extensive promotion campaign on electric school heat. Directed to school authorities, school architects, and consulting engineers, it emphasizes the importance of deciding upon the type of heat before the school is designed.

A new 8-page brochure, "The A-B-Z of Electric Heat Today," dramatizes the point that all of electric heat's advantages and economies cannot be realized when it is considered as an alternate system in a school designed for wet heat. And, since the architect and engineer cannot make two complete sets of plans for a single school—one with boiler room and piping and trenches, and another with just electrical connections, the brochure urges the decision on type of heat before the building is planned. This choice is called the "first and most determining decision" in planning a school.

The brochure lists the advantages of electric heat, its economies in initial construction as well as in annual operating costs, and covers the declining relative cost of electricity as compared with fossil fuels. Electric heat's further advantages in school additions or planning for future expansion are also covered with a description of the "plug-in" classroom, which heats itself without help from an overloaded boiler room.

Electromode is mailing the brochure to all listed electrical contractors, utilities, as well as to school architects, engineers, and school authorities. It is being followed up by file folders with detail drawings, specification sheets, control and wiring diagrams, success stories of electrical heated schools, publicity, advertising, and local meetings. Details may be obtained from local Electromode representatives or from Electromode, 570 Culver Road, Rochester 9, New York.

The Certified Inspiration Lighting program developed by the Moe Light Division of Thomas Industries, Inc., gets final review by (from left to right) Lee B. Thomas, chairman of the board; Frederick Keller, president; and E. Allen Lea, Moe Light sales manager.

Inspiration Lighting program underway

AN ENTIRELY new program for the lighting industry, "Certified Inspiration Lighting," has been introduced by Thomas Industries, Inc., of Louisville, Ky., one of the nation's largest manufacturers of lighting fixtures.

"The Certified Inspiration Lighting program has been conceived and developed by Thomas Industries to provide the standards necessary to achieve inspiration lighting in every home," Frederick

Keller, president of the company, said.

The program provides all of the tools needed for the architect, the electrical contractor, and the home builder to put inspiration lighting in the homes they fashion and construct.

The Certified Inspiration Lighting program is based on five main principles:

Impression lighting, designed to create dramatic and decorative effects on furnishings, walls, and objects in every room and the exterior of the home.

Comfort lighting, for overall personal comfort when reading, studying, playing cards, dressing, or working.

Convenience lighting, where functional overall lighting is needed for every day family living.

Safety lighting, with night lights to guard against "bumping into things" or stumbling on stairways in halls, porches, and other danger areas.

Protection lighting, for outdoor safety along driveways, entrances, and the grounds as well as for pleasant outdoor living.

"Experience in a distributor's office or showroom or with an electrical contractor, architect, draftsman, or public utility may qualify a prospect for this special training," said Keller.

The basis of the program is a unique planning kit containing a book of standards, a homeowner's lighting guide, a presentation portfolio, practice diagrams, drafting tools, merchandising material, home owners certificate, fuse box sticker, model home signs, newspaper advertising mats, publicity release, product catalogs, price sheets and fixture recommendation sheets.

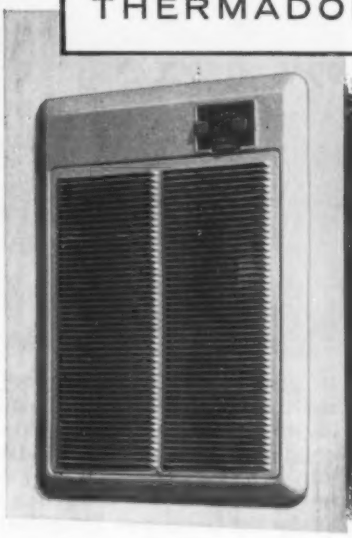
Heating committee cites consumer education need

THE NEED for a major program of consumer education on electric heating was stressed in a report made recently by the chairman of the Electric Heating Committee of the National Association of Electrical Distributors.

The report was based on data obtained in a recent survey of NAED members. W. C. Wallis, committee chairman, delivered the report at the annual meeting of the Electric Heating Committee which was held in Nashville, Tenn. NAED member distributors and representatives of electric heating equipment manufacturers attended the meeting.

THERMADOR

"Seven Leagues Ahead" in the science of electric heating



1. Silent turbo-blade fan
2. Nichrome heating element
3. Fibreglas insulation
4. Flush to wall safety grille
5. Down-draft discharge "Heats the Living Zone"
6. Heavy-duty micro-switch thermostat
Model NW "Master Duty"

So Simple to install... Flush to the Wall!

The fastest "living-zone"*heater...

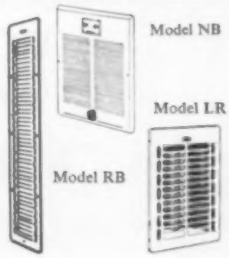
(*Head-to-heels area. Costly ceiling heat losses are minimized.)

THERMADOR "BILT-IN" ELECTRIC HEATER...

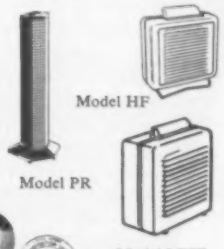
The popular Thermador Model "NW" Fan-type "Bilt-in" Electric Heater is designed to be installed quickly and easily between existing studding without extra framing. Powerful turbo-blade fan draws air into the heater, warms it in a heating chamber and gently distributes the heated air throughout the "living zone" of the room. Heating element safely out of the way of prying fingers. Fast heating nichrome wire – no heavy castings to pre-heat. Residual heat expelled so efficiently, heater is UL approved for top wiring. Equipped with top-located finger-lift controls, neon indicator light, thermostat for automatic control and safety thermo-cutout. The fan circulates heat in winter and provides cool air circulation in summer. Smartly designed, finished in Spanish Gold baked enamel. 2000 to 4500 watts output, 240 volts A.C., from 6824 to 15,354 BTUs per hour. Overall grille size–21" high, 16¾" wide, 15/16" from wall to edge of louver.

Safe, Reliable, Clean, Fast, Efficient

BILT-IN ROOM HEATERS



PORTABLE ROOM HEATERS



The Originator of the Fan-Type Electric Heater

THERMADOR

ELECTRICAL MANUFACTURING COMPANY

Division of Norris-Thermador Corporation

5119 District Blvd., Los Angeles 22, Calif.

See your nearest Thermador distributor or call or write the Thermador sales representative.

Ala., Fla., Ga., Miss., So. Ky., N. C., S. C., Tenn. — Biglin Assoc., Inc., 177 Harris St., N.W., Atlanta, Ga.

Ill., Ind., N. Ky., E. Mo. — Klaton Chapman, 11-104 Merchandise Mart, Chicago, Ill.

Kan., W. Mo., E. Neb., Okla. — W. H. Faber Co., P.O. Box 7043 C.C. Sta., Kansas City, Mo.

Ohio — Robert E. Williams, 19119 Wickfield Ave., Cleveland, Ohio.

Ark. — C. A. Birmingham, 3546 Oakley Ave., Memphis, Tenn.

La., Tex. — W. E. Tallman, 2236 Sutter St., Dallas, Tex.

Md., Va., W. Va. — Warren J. Gottemeyer, Apt. E, 411 Hunting Towers, Alexandria, Va.

"Consumers in many parts of the country know very little, if anything, about electric heating—let alone, the many advantages it has to offer," Mr. Wallis commented. "They don't know what it is, how much it will cost, and what it will cost to operate."

The chairman cited his committee's belief that a consumer education program would spur consumer demand for electric heating.

Mr. Wallis listed some of the problems brought up by members who participated in the survey and gave particular emphasis to these: lack of electric heating promotion by some utilities; absence of interest and knowledge of electric heating on the part of some electrical contractors, builders and architects; electric power rates are too high.

On this last mentioned problem, Mr. Dallis shed an optimistic ray of light when he said, "It is interesting to note that even in those sections of the country where electric power rates are not too low, many distributors are doing a fairly good job of selling electric heating, although it is more expensive than other types of fuel, because they are selling consumers on electric heating's many advantages."

HOUSTON MEDALLION HOME PROMOTION SUCCESSFUL—Houston Lighting and Power Company's "Reddy Wired" cartoon symbol identifies Medallion Homes displayed at Meadowbrook Freeway Subdivision. Promotion of the Medallion Home Program wound up successfully as 55 model homes were viewed in the Houston Lighting and Power service area. All-out promotion by the utility included bill enclosures; newspaper, radio and TV advertising; truck and outdoor posters; plus floodlights and bronze medallions at model home sites.

As a means of building the vitally needed consumer education program, the chairman affirmed that his committee "is going to encourage the NAED membership to establish closer relationships with local electrical contractors, builders and architects in an effort to sell electric heating. We are also going to encourage our members to establish a closer liaison with their utilities."

Mr. Wallis emphasized the need for the distributor himself to publicize electric heating to the consumer in his area. He indicated that it would be highly desirable if more electric heating equipment manufacturers would give serious consideration to providing more advertising at the local level—a measure which would intensify the distributors' promotion.

The NAED survey supplied the committee spokesman with additional absorbing information. He remarked that 90 per cent of the NAED members are actively promoting and selling electric heating equipment and more than half of the remaining 10 per cent who do not handle electric heating equipment have made known their interest in taking on this line.

Mr. Wallis also disclosed the percentages of NAED members who handle electric heating equipment in relationship to the particular types of equipment they distribute. This revealed the following interesting figures: 95% handle plug-in portable heaters; 81% handle baseboard units; 80% handle built-in wall resistance heaters; 55% handle radiant wall panels (glass, ceramic or metal); 54% handle commercial and industrial types; 51% handle ceiling cable; 6% handle central furnaces.

Testifying to the rapid advance the association's membership is making in this field, Mr. Wallis

HIGH AIR VOLUME

AT LOW COST

with "BUFFALO"

PACKAGE PROPELLER FANS

- Rugged, Long-Lasting Design Features
- Low Maintenance Cost
- Low Installation Cost
- Low Operating Cost
- Low Initial Cost
- Quiet, Efficient Ventilation

For low-cost ventilation and exhaust in commercial and industrial jobs, you can't beat "Buffalo" Propeller Fans. "Buffalo" offers a complete line to suit the broadest range of requirements . . . from a small room to a large plant: sizes 24" thru 120" deliver 5,000 to 250,000 cfm. Shipped *completely assembled*, ready to install and operate. Write for Bulletin FM-315 and prices.

BUFFALO FORGE COMPANY

210 MORTIMER ST., BUFFALO, N. Y.

"Buffalo"

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS • BELTED VENT SETS • PROPELLER FANS • "E" BLOWERS — EXHAUSTERS

the production of oil and gas, re-

added that, although the heat pump is comparatively new item in the electric heating field, already five per cent of the NAED members who handle electric heating are actively promoting and selling these units.

AIEE petroleum conference planned

MORE THAN A SCORE of symposiums and discussions on the growing importance of electric power in

Dates Ahead

American Institute of Electrical Engineers, Petroleum Industry Conference, Baker Hotel, Dallas, Sept. 15-17, 1958.

Public Utilities Association of the Virginias, 40th Annual Meeting Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 18-21, 1958.

Edison Electric Institute, Meter and Service Committee, Plaza and Driscoll Hotels, Corpus Christi, Texas, Sept. 22-24, 1958.

Oklahoma Utilities Assn., Light and Power Conference: Eastern District, Western Hills Lodge, Lake Sequoyah, Wagoner, Okla., Oct. 16, 1958; Western District, Lawtonian Hotel, Lawton, Okla., Oct. 17, 1958.

Southeastern Electric Exchange, Engineering and Operation Section, Hotel Roanoke, Roanoke, Va., Oct. 20-21, 1958.

International Association of Electrical Inspectors, Southern Section Thirtieth Annual Meeting, McAllister Hotel, Miami, Fla., Oct. 20-22, 1958.

Power Distribution Conference, University of Texas, Austin, Tex., Oct. 20-22, 1958.

National Association of Corrosion Engineers, South Central Region Annual Conference and Exhibition, Roosevelt Hotel, New Orleans, Oct. 20-24, 1958.

National Electrical Contractors Association, Annual Convention, Dallas, Texas, Nov. 19-22, 1958.

Oklahoma Utilities Assn., Annual Convention, Mayo Hotel, Tulsa, Okla., March 26-27, 1959.

Fluoresign outdoor luminaire provides more light for poster panels and walls

Higher Output — Revere's Fluoresign Outdoor Luminaire now takes the new VHO, SHO, and Power-Groove lamps. Provides higher light intensity on the advertiser's message.

Integral Reflector and Lamp Assembly — The entire unit rotates to keep lamp and reflector always in the correct position, providing efficient, uniform light distribution. Reflectors join to form a continuous, unbroken line that blends in with the poster panel.

Flexibility — Any combination of 4, 6, or 8-foot Fluoresign reflectors can be joined to make an attractive luminaire of any desired length. Requires only a minimum stock, too. A special 18 ft. poster panel unit lets you use two 8-foot lamps to light a standard 24-sheet poster panel.

Easier Maintenance — All compressible sockets make re-lamping fast and easy. Luminaire is weathertight. Degree-marks on socket assembly make it simple to adjust reflector to desired angle.

Write for Fluoresign Outdoor Luminaire Bulletin 300-21

Revere OUTDOOR LIGHTING

Revere Electric Manufacturing Co. • 7420 Lehigh Avenue, Chicago 48, Illinois

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

the production of oil and gas, refining and transportation are scheduled for the fifth Electrical Conference of the Petroleum Industry at the Baker Hotel, Dallas, Tex., Sept. 15-17. It is sponsored by the American Institute of Electrical Engineers. D. S. Coffman, Texas Power & Light Co., Dallas, is the conference chairman.

Among the symposiums will be a panel discussion on batch interface detectors, with C. F. Barnard, Pipeline Engineering Co., as the moderator. Panelists will be: C. V. Baxter, Salt Lake Pipeline Co., C. W. Blackburn, Phillips Petroleum Co., R. R. Hancox, Great Lakes Pipeline Co., W. W. Holt, Jr., Plantation Pipeline Co., and R. L. Smith, Southeastern Pipeline Co.

At the general luncheon, Monday, Sept. 15, L. E. Oberhelman, Standard Oil Company of Indiana, outgoing chairman of Petroleum Industry committee, will preside.

Several sub committee meetings are planned. They include Production, with C. H. Eckel, chairman of the Sub Committee on Production, presiding; Transportation, with C. D. Catt, new chairman of the Transportation Sub Committee, and Refining, with Lee B. Eddy, new chairman of the Refining Sub Committee, presiding.

Hubbard and Company's new Electrical Research Laboratory at McCook, Ill., is equipped with facilities for creating, testing, and perfecting diverse products for the electric and communication utilities.

New Hubbard research facilities announced

OPEN HOUSE was held recently in conjunction with the formal opening of Hubbard and Company's new Electrical Research Laboratory in McCook, Ill., a suburb southwest of Chicago. Typical test demonstrations were conducted using the laboratory's modern electrical research facilities which can duplicate conditions existing in power systems today and in the forseeable future.

Located on a seven-acre tract, this completely functional laboratory is equipped with facilities for creating, testing and perfecting diverse products for the electric and communication utilities. Realistic appraisals can be made of tests conducted under conditions which are the same as those encountered in the field. This first hand knowledge provides the logical basic information for product design and development.

Virtually every type of transient over-voltage and over-current disturbance on an actual system can be produced in the laboratory and its effect on distribution systems can be accurately analyzed.

The major laboratory high-voltage equipment includes a 3,200,000 volt lightning generator, an 80 kw-sec 100 kv surge current lightning generator, a 600 kv 60-cycle high voltage test set, and 60-cycle short circuit testing equipment. The 3,200,000 volt unit is capable of creating a sparkover across a 17 foot air gap.

Latrobe PRODUCTS

FLOOR BOXES & WIRING SPECIALTIES

"Latrobe" Floor Boxes and Wiring Specialties are designed to do their job easily and surely with no excess parts.

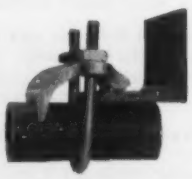
This same compactness of design makes for fast, easy installation.

Adjustable Watertight Floor Boxes

All adjustable boxes are now equipped with a positive bond which makes them completely fire-proof.

"Latrobe" Pipe or Conduit Clamp

This clamp is made with a double safety bite of case hardened tool steel. Two models—Right Angle and the Parallel support. Each model comes in 10 sizes to handle pipe or conduit ½" thru 4".



Represented in the South by

CARY CHAPMAN & COMPANY
702 Whitehall St., S.W., Atlanta, Ga.
213 S. Front St., New Orleans 12, La.
1009 South Elm St., Greensboro, N. C.
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3370 N. W. 37th St., Miami, Fla.

F. P. WALTER COMPANY
4030 Chouteau Ave., St. Louis 10, Mo.

JIM ROBERTSON & COMPANY
2104 Irving Blvd., Dallas, Texas
1901 Commerce St., Houston, Texas

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

High power testing will be conducted at a specially designed power laboratory, adjacent to the main building, where power is available in a wide range of voltages and currents. A concrete barricade with bullet-proof glass will permit visual observation at close range.

In addition to the high bay, designed to permit operation of the impulse generators at maximum voltage, and the conference room, the main building houses engineering and design facilities, a mechanical testing laboratory, a chemical laboratory, a complete machine shop, and a reference library. Unusual photographic equipment is available which Hubbard research and development engineers use for ultra high speed recording of various phenomena associated with high voltage and high current test.

Comprehensive outdoor electrical tests and mechanical tests can be conducted in the outdoor testing area. Poles, structures, and pole line hardware assemblies have been built for test purposes. Sections of power and communication lines have been erected for test and demonstration purposes as well.

Manufacturers appoint new representatives

EDWIN F. GUTH Co., of St. Louis, Mo., has announced the appointment of D. Jack Clark as lighting

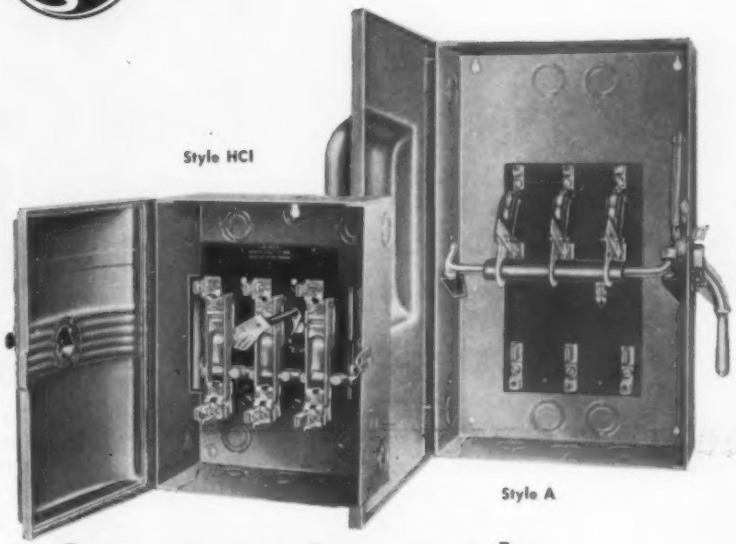
D. Jack Clark

sales engineer for Georgia and parts of South Carolina, including Charleston and Columbia.

* * *

NELSON ELECTRIC Manufacturing Co., of Tulsa, Okla., has announced the appointment of William D. Johnson as sales representative in Washington, D. C.

SAFETY SWITCHES



give you extra service —extra safety

Extra margin of safety

General Electric HCI heavy duty safety switches have operated successfully 50,000 times—an extra safety margin of 400% over standard U/L requirements.

Extra "ON"—"OFF" Indication

New easy-to-see yellow "SAFETY FLAGS" mounted on HCI pole units give positive indication of blade contact position—from *over 50 feet away!* No guessing whether switch is on or off. You know . . . *immediately!*

Extra years of service

Many users report General Electric Type A heavy duty switches still working perfectly after over 30 years of service.

Extra wide selection

General Electric normal and heavy duty switches are rated from 30 to 1200 amperes, up to 600 volts; single- and double-throw operation; 2, 3 or 4 pole design; fusible or no fuse. All general and special purpose enclosures. For extra service and safety—standardize on G-E safety switches.

General Electric Company, Circuit Protective Devices Department, Plainville, Conn.

GENERAL ELECTRIC

GENERAL SWITCH Co., of Brooklyn, N. Y., recently announced the appointment of William F. Bishop, 203 Walker St., S. W., Atlanta 3, Ga., as sales representative in Alabama, Georgia and Northeast Florida.

* * *

JOHN C. VIRDEN Co., of Cleveland, Ohio, has named Dale Gunther as sales agent for its line of lighting fixtures in Maryland. Mr. Gunther will headquarter in Philadelphia.

Dale Gunther

Murray Reiter, right, president of Light and Power Utilities Corp., discusses the soon-to-be released incandescent lighting equipment catalog with T. R. Saloman, manager of the company's Delta Division.

EJS LIGHTING Corp., of Los Angeles, Calif., has named the W. N. Kennon Company as agents for Georgia, Alabama and Mississippi, according to a recent announcement by Irving P. Siegle, general sales manager. W. N. Kennon and Guy Johnson will cover the three states. EJS is represented in the South also by James I. Schwarz of Charlotte, N. C., who covers North and South Carolina and Tennessee and by the A. M. Orlick Co., covering Florida, Louisiana and Texas.

Brief news notes of manufacturers

LIGHT AND POWER Utilities Corporation, of Memphis, manufacturers of fluorescent fixtures, has acquired Delta Incandescent Manufacturing Co., Inc. T. R. Saloman, former Delta owner, has joined L & P as sales manager of the Delta Division. (See photo above.)

* * *

WESTINGHOUSE Electric Corporation has announced that it will transfer the responsibility for the manufacturing and marketing of electric heating equipment from Sunnyvale, Calif., to the air conditioning plant at Staunton, Va.

* * *

HEIN-WERNER Corporation of Waukesha, Wis., has announced the purchase of the assets of Tal Bending Equipment, Inc., of Milwaukee, manufacturers of a complete line of pipe bending equipment. Inventory and operations will be moved to the Hein-Werner plant.

"Iggy Oogle Woo"— meaning
"AMERICANS NOW HAVE
Welcome Warmth"
thanks
to MARTIN

ELECTRIC HEATERS

Automatic Wall Heaters • Automatic Portable Room Heaters • Recessed Bath Heaters • Ceiling Cable • and Baseboard Electric Heating

10 Year Guarantee
Against Burn-Out of Heating Elements
Send for new complete catalog

Manufacturers of Quality Heating Equipment since 1905

MARTIN STAMPING & STOVE CO., Huntsville, Ala.

News about people

The election of **L. F. Hickernell** of Dobbs Ferry, N. Y., as 1958-59 president of the **American Institute of Electrical Engineers** was announced during the Summer General Meeting of AIEE in the Statler Hilton Hotel.

Mr. Hickernell, who is vice-president-engineering for Anaconda Wire and Cable Co., has been active in the world-wide Institute for many years, and is now completing a term as treasurer. He received a bachelor's degree in mathematics-physics from Masachusetts Institute of Technology in 1922 and a bachelor's degree in mathematics from Grinnell College. He has been with Anaconda since 1931, following engineering work with Iowa Light, Heat and Power Co., the General Electric Co., Consumers Power Co., Commonwealth Power Corp., Stevens & Wood, Inc., and Allied Engineers, Inc., Jackson, Mich.

J. L. Singleton, vice-president, Industries Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has been elected president of the **National Electrical Manufacturers Association** to fill the unexpired term of the late **W. V. O'Brien.**

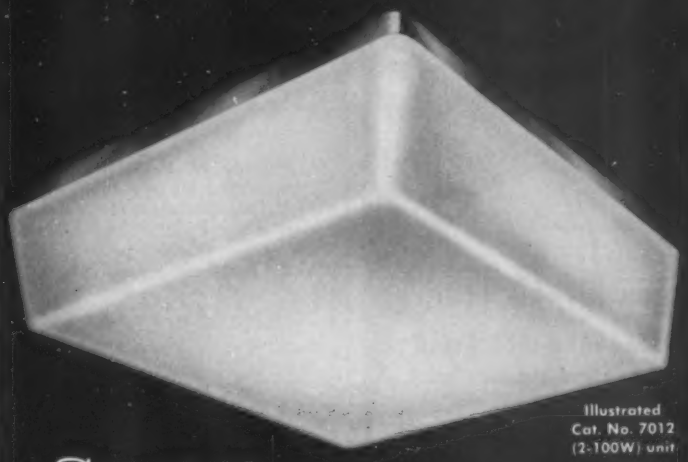
Mr. Singleton has been a member of the NEMA Board since 1952, and served as an association vice-president since 1955. The association will elect its 1959 officers at the annual convention next November at Atlantic City, N. J.

Clyde O. Carpenter, commercial manager of **Knoxville Utilities Board,** has won the 1958 Community Services Award. It was presented recently at the annual meeting of the Council of Community Services. Some of the organizations in which he has taken an active part during the past eighteen years include the Red Cross, the Community Chest, the United Fund, Easter Seals, Crippled Children and Polio fund raising campaigns; Boy Scouts; PTA; Society for Advancement of Management; Junior Chamber of Commerce; Air Force Reserves and the Safety Council.

Robert Wardle, Jr., of Atlanta, assistant to the vice-president in charge of finance of the **Georgia Power Company,** was elected a vice-president of **The Southern Company** at a recent meeting of the board of directors.

Mr. Wardle will be assigned to work on system planning and operation and budgetary matters. He has been connected with the Georgia Power Company since his graduation from Georgia Tech in 1934 with a degree in civil engineering.

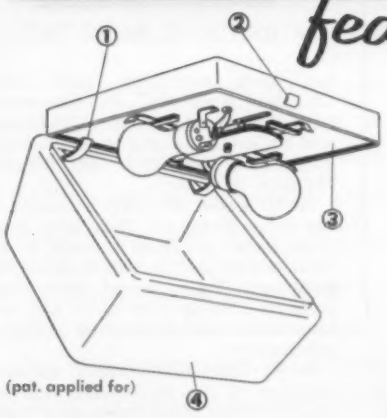
New PRESCOLITE



Illustrated
Cat. No. 7012
(2-100W) unit

Square
DRUM Fixtures

featuring



(pat. applied for)

1. Convenient glass hanger
2. Delayed cam action glass release
3. All "DieLux" die cast aluminum canopy
4. Beautiful, satin finished, hand-blown "Thermopal" glass

A new conception in square drum lighting. The only drum unit with canopy and integral mechanical parts constructed from weather resisting, non-corrosive "DieLux" die cast aluminum. A fixture of excellent low brightness suitable for many general lighting applications. Unit allows simplified relamping and fast, easy maintenance. Canopy finish: Satin Chrome.

Available in two sizes: Cat. No. 7009 (2-60W), 9" square and Cat. No. 7012 (2-100W), 12¾" square.

Write for your copy of the Complete PRESCOLITE Catalog

PRESCOLITE MANUFACTURING CORPORATION
HOME OFFICE: 2229 Fourth Street, Berkeley, California
FACTORIES: Berkeley, Calif. • Neshaminy, Pa. • El Dorado, Ark.

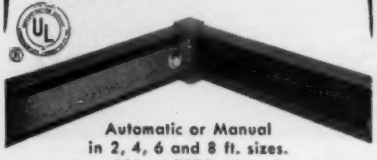
MARKEL
Electric Heat

★ BUILT-IN ★ PORTABLES
★ Wall Attachables ★ BASEBOARDS

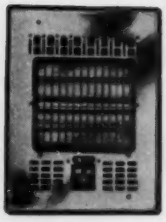
Fan-Forced! Radiant! Natural Convection!
Automatics & Manuals
500 to 5000 WATTS

New ELECTRIC Thrift Trim
BASEBOARD HEETAIRES
More Heat at Less Cost!

Cost less to buy . . . less to install! Over 300 watts per ft. Simple mounting. Splice boxes prewired to elements!



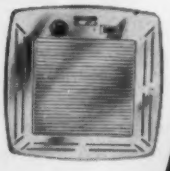
Automatic or Manual
in 2, 4, 6 and 8 ft. sizes.
500 to 3000 watts.



RADIANT
Wall-Insert
HEETAIRES
Low Cost
Automatic &
Manual Heaters

Series 240 *1000 to 1500 Watts*

New
Fan-Forced
BATHROOM
HEETAIRES
Manual and
Automatic



1250 and 1500 Watts Series 520

FREE LITERATURE!
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LA SALLE Products, Inc.

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Export Office: 15 MOORE ST., N.Y. 4, N.Y.
In Canada: MARKEL Electric Products, Ltd., Ft. Erie, Ontario

Officers of The Southern Company re-elected for the coming year are: **C. B. McManus,** chairman of the board; **Harllee Branch, Jr.,** president; **James F. Crist,** vice-president; **T. H. Vaden,** vice-president; **L. H. Jaeger,** vice-president and treasurer; **J. H. McGuire,** vice-president; **D. B. Peck,** secretary; **Roger F. Boudet,** assistant secretary and assistant treasurer; **George B. Campbell,** assistant secretary and assistant treasurer, and **H. G. White, Jr.,** assistant secretary and assistant treasurer.

Charles W. Parker, Jr., has been named director of sales promotion in the **Allis-Chalmers Industries Division,** a new position created to expand the scope of sales promotion in line with company growth. Mr. Parker

Charles W. Parker, Jr.

has been associated with Allis-Chalmers since 1947. He has served as district manager both at Richmond and Philadelphia and is an electrical engineering graduate of Virginia Military Institute.

A. R. Tofte, formerly manager of the Advertising and Industrial Press Department, becomes manager of the Publications and Industrial Press Department. Tofte joined Allis-Chalmers in 1938 as copy chief and was later appointed director of employee publications.

J. W. Murphy, formerly assistant manager of the Advertising and Industrial Press Department now heads the Advertising Department. Mr. Murphy came to Allis-Chalmers in 1951 as supervisor of special assignments.

Announcement has been made of the promotion of **Carroll H. Walsh** to the position of chief engineer at **Arkansas Power and Light Company.** Mr. Walsh began his career with AP&L in 1927 as an assistant engineer—the same year he received an electrical engineering degree from the University of Arkansas.

D. L. Harper, peninsular district manager of **Graybar Electric Co., Inc.,** announces the appointment of **J. P. Majors as manager** at Jacksonville.

J. P. Majors

Mr. Majors began employment with Graybar in 1937 as warehouseman in Atlanta. Since that time he has held positions in the Atlanta service department, as Chattanooga service supervisor, as operating manager at Columbia, South Carolina, as operating manager at Birmingham, as lighting sales manager at Atlanta, and as inside construction sales manager at Atlanta.

Appointment of **John W. Belanger** as general manager of apparatus sales for the **General Electric Company** has been announced by **Arthur F. Vinson,** vice-president and group executive of the company's Apparatus and Industrial Group. Mr. Belanger succeeds the late Wiliam V. O'Brein.

Joining the company in 1917 as a student engineer, he successively held engineering and sales positions

John W. Belanger

in Schenectady, and Philadelphia. By 1943 he had advanced to manager of the Federal and Marine Divisions. He later headed the Turbine and the Large Apparatus Divisions. In 1951 Mr. Belanger was elected a company vice-president and appointed to head the Defense Products Group. He was named executive vice-president in 1954 and assigned to head Industrial Components and Materials.

The Board of Directors of the **American Institute of Electrical Engineers** has elected **Percy H. Robin-**

son, operations vice-president at Houston Power and Light Co., to the grade of Fellow. The grade is the highest attainable in the world-wide representative society of the profession and is awarded for outstanding engineering contributions. Mr. Robinson received his citation "for contributions to economical design and protection of an electrical system," according to an announcement by **N. S. Hibshman,** secretary of the Institute.

Mitchell P. Kartalia, general manager of marketing at **Square D Company** has announced the appointment of **Robert E. King** to the position of distribution equipment sales manager. In his new position, Mr. King

Robert E. King

will be responsible for all distribution equipment sales programs, including the headquarters sales department, field office liaison, general sales procedures and field engineer training. He joined Square D as a student engineer in 1947 upon graduation from Purdue University.

The retirements of two vice-presidents of the **Potomac Edison Co.,** Hagerstown, Md., were recently announced by **D. E. Stultz,** president of the company.

S. S. Bradford joined Potomac Edison in 1934 from the Chesapeake and Potomac Telephone Co. He has served as promotional manager and general commercial manager and was elected a vice-president in 1954. In addition he has been responsible for the development of the company's extensive farm, commercial representative area development, and manpower development programs.

A. F. MacDonald joined a subsidiary of Potomac Edison System in 1926—the Blue Ridge Bus Lines. He held various key positions in that organization and in 1947 was named a vice-president of the Potomac Edison Co.

"The retirements of Mr. MacDonald and Mr. Bradford bring to a close a distinguished record of achievement and progress in the utility field," said President Stultz.

BIG BLOWERS ARE BIG BUSINESS WITH PEERLESS

QUIET! TROUBLE-FREE! DEPENDABLE! HEAVY DUTY! GUARANTEED!

Versatility in size, application, and engineering has always been a Peerless strong point. Peerless builds its own motors and matches them to the specified blower requirements. Peerless blower frames and housings are usually heavier than any competitive products. Result—a quiet, vibration-free unit.

These are not "off-the-shelf" units, but built to customer rotation and discharge specifications. Each one receives 100% inspection before it leaves the Peerless factory. Each unit is built to industry standards. Motors are built to NEMA standards. Each unit is ready for operation when received at the installation site.

Write Today For Complete Line Catalogs

A COMPLETE LINE OF AIR MOVING EQUIPMENT

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FANS - BLOWERS - ELECTRIC MOTORS

Technical books

for the electrical man

Lighting

"Lighting Handbook." Published by Westinghouse Lamp Division, Bloomfield, N. J., 250 pages, $3.00.

This new edition contains comprehensive coverage of the general field of modern lighting practices. Included is a fold-out page of the electro-magnetic spectrum, information on distribution and light measurements, a revised section on the newest light sources, information on coefficients of utilization and maintenance factors, together with footcandle tables, and many application illustrations useful in dealing with modern lighting problems.

In addition, the manual contains chapters on interior wiring, school and office lighting, store lighting, industrial and architectural lighting, floodlighting design, street and sign lighting, germicidal and sun lamps, and the cost of lighting.

Insulating fundamentals

"Insulation Engineering Fundamentals," by Graham Lee Moses, with some chapters coauthored by Rueben Lee and Robert J. Hiller. Published by Lake Publishing Co., Lake Forest, Ill., 117 pages, $2.75

One of the world's top insulation authorities, Mr. Moses, manager of service engineering of the Westinghouse Electric Corporation's large rotating apparatus department in East Pittsburgh, Pa., has presented every important aspect of insulation in detail.

Packed with the most up-to-date knowledge on insulation, the book describes every phase from basic concepts, selection, application, construction testing of insulation for large and small rotating machinery and electronic equipment.

All 22 chapters provides information necessary for practical use. Even a glossary of insulation words and phrases is provided in the back the book.

TV trouble

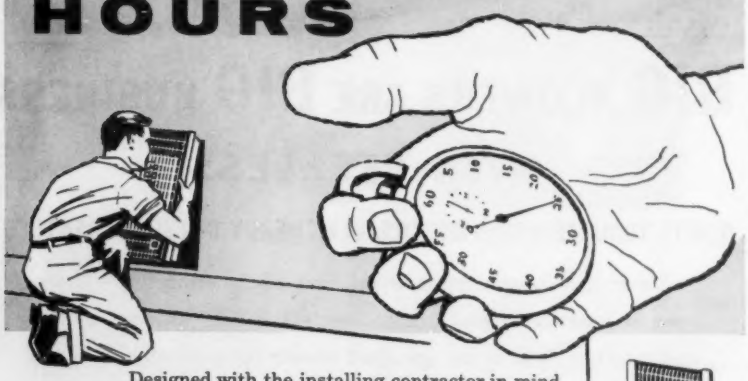
"Pin Point Color TV Troubles in 15 Minutes," by Harold P. Manley. Published by Coyne Electrical School, 500-526 South Paulina St., Chicago 12, Ill., 548 pages, illustrated, $5.95.

This practical trouble shooting book written for servicemen covers 150 types of faulty pictures with over 1000 troubles which cause faulty reproduction. Detailed cross references permit rapid location of source of picture trouble. The book utilizes check-charts to point out possible troubles.

Accompanying these trouble shooting charts are explanations of circuits and designs used in the majority of TV receivers both black and white and color. These explanations (all based on actual field tests) clarify the use of the check charts technique.

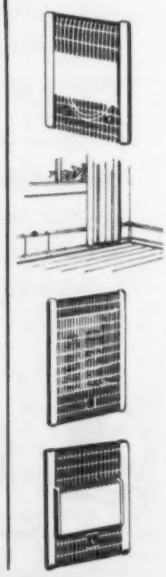
The entire purpose of the book is toward faster trouble finding. Constant comparisons of black and white TV trouble shooting with color TV problems are used as a means of easier understanding by the serviceman who has never worked on a color TV set. In this way the serviceman utilizes his knowledge of black and white TV to more easily understand color TV problems.

WESIX SAVES Installation HOURS



Designed with the installing contractor in mind as well as the perfect comfort of the home owner, WESIX Wiredheat units save real money all through the job. Here are just a few features which can cut HOURS from job time, hours that might otherwise EAT UP PROFITS:

- **REMOVABLE TERMINAL ENCLOSURE.** On all WESIX Wall Furnaces and Convectors, this exclusive feature makes connections twice as easy, makes for a neater job.
- **PRESSURE CONTACTS.** On WESIX Monofin Baseboard you wire only to the raceway plate. Heating sections are automatically connected by contact terminals when they are fitted in place.
- **DROP-IN PLUG** on WESIX Floor Convectors mean quick and easy installing as well as safe and easy cleaning for customer.
- **CONVENIENT KNOCK-OUTS** on all WESIX units are placed just where you need them . . . AND they break out quick and clean.
- **RUGGED CONSTRUCTION** of all components minimizes damage on the job and in transportation . . . eliminates hours spent in repairing and refitting parts.



These are just a few of the reasons why contractors prefer to install WESIX Automatic Electric Heating equipment... products that show the results of *more than 35 years of WESIX leadership* in electric home heating.

Learn how WESIX can help you to more profits in modern electric heating. Call your local Wesix representative or write today to:

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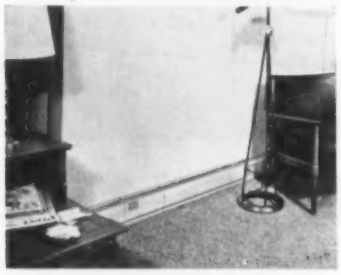
HUNTSVILLE • INDIANAPOLIS • LOS ANGELES • NEW YORK • PHOENIX
PORTLAND • SACRAMENTO • SAN DIEGO • SEATTLE • SPOKANE

New products

Baseboard heaters have enclosed heating element

THE ELECTRIC HEATING Division of the Cavalier Corporation, 343 W. First St., Chattanooga 2, Tenn., has introduced in Cavalier Baseboard Heaters a new, fully enclosed heating element that provides uniformity of heating, cleanliness and reliability.

The element is the same type used in modern electric ranges—a highly compressed tubular steel sheath containing the resistance element. Welded continuously to the tubular steel sheath is a vertical fin which radiates heat without creating dust traps.



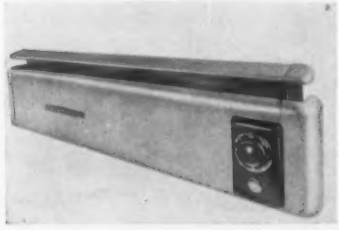
Surface temperature of Cavalier Baseboard never exceeds 125 degrees F., yet output is 200 watts per lineal foot.

The Cavalier Automatic Electric Baseboard installs in new or old homes without cutting into walls. Thermostatic control section builds into baseboard lineup—as do 115V convenience outlets. Any desired number of outlets may be installed, each between any two baseboard sections. Cavalier Baseboard is available in 32" or 48" sections, convenience outlets, thermostatic control section, corner pieces and end caps.

For additional data, ask for item P-814, using the coupon on page 119.

Electric baseboard heater features fast installation

FAST AND SIMPLE installation is a feature of a new completely assembled and painted electric baseboard heater for any size room, from supplemental room heating to complete home or motel, available from



About the worst mess we ever got into happened a while ago, when an alarming number of our photoelectric street lighting controls began failing in the field. (Failing *off*, yet!) Needless to say, we kept hopping until we got to the bottom of the trouble.

The failures, for the most part, were finally traced to an elusive defect in one component. A "bad batch" of them had apparently gotten into the controls made in a certain period, causing them to fail left and right. Once *that* was discovered, this component was replaced in a hurry. In the process, we also revamped our own inspection and testing methods, and straightened out a few other home-grown problems as well. The odds are now pretty long against such wholesale trouble ever happening again.

Our customers concerned got a full report of what was going on and what we were doing about it. They were asked to ship back to us all the controls and stocks of the bad component date coded for that period, plus *any* future failures they felt were chargeable to this earlier trouble. All expenses for this were our problem, not the customer's. Although this went a couple of miles beyond our regular warranty, it was our idea of what should be done.

Well, so much for the Troubles We've Seen. The moral is—a guarantee is a lot *more* than words printed on a piece of paper. How would you feel about that guaranteed product shown above—if you couldn't depend on the leash?

The Fisher-Pierce Co., 59 Pearl St., So. Braintree 85, Mass.

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

the Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa. This new Chromalox electric heater, type BRT, is constructed of heavy-gauge steel and has a built-in thermostat.

Four screws hold it to the wall and a simple electrical connection both energize and automatically control temperatures. The sensing element in the built-in thermostat is mounted on the outside under the control knob, where it samples the room air and accurately controls room temperature to within 2°F. through a control range from 55° to 85°F.

The thermostat is mounted to a standard terminal box, spot welded to the back panel. This permits direct wiring from back, side or bottom of the box to the thermostat.

For additional data, ask for item P-815, using the coupon on page 119.

Heating, ventilating units designed for classroom use

TO MEET THE WIDENING demand for electric heat in new school buildings and school additions, new companion heating and ventilating units especially designed for classrooms are announced by Electromode, Division of Commercial Controls, 570 Culver Road, Rochester 9, N. Y.

Both of the new Electromode classroom units are basically the same, with the same ability to draw in, filter, heat and discharge the required volume of warmed air completely automatically and according to the use programming of the schoolroom. The heating unit warms and recirculates inside air, while the ventilating unit faces the opposite direction to draw in outside air

through a louvered wall opening. Both discharge filtered, warmed air upward along the classroom wall. There is no concentrated hot spot or air blast.

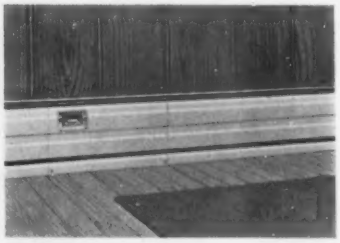
Both units have the same propeller-type fan with aluminum blades especially designed to provide the required volume of air with a minimum of noise. Both units accept the same range of interchangeable case aluminum safety heating grids for unit capacities up to 6000 watts. The companion units are both shallower and lower than the conventional combination units. They are identical in outside appearance and can be free-standing or mounted, with matching bookshelf units, on a continuous wireway base.

For additional data, ask for item P-816, using the coupon on page 119.

Baseboard heater sections produce 200 watts per foot

AN ELECTRIC BASEBOARD heater section only 2-1/16 inches thick and six inches high is being marketed by the Hunter Division of Robbins & Myers, Inc., 2500 Frisco Ave., Memphis 14, Tenn.

Provided in 32- and 48-inch lengths, the heat sections make possi-



ble any installation in multiples of 16, 32, 48, 64, 80 and 90 inches, or more. The baseboard produces 200 watts per lineal foot.

The aluminized front reflective baffle maintains a relatively cool surface—125 degrees F. Accessories include thermostatic control unit, 220 or 110-volt convenience outlet box sections, end caps and corner pieces.

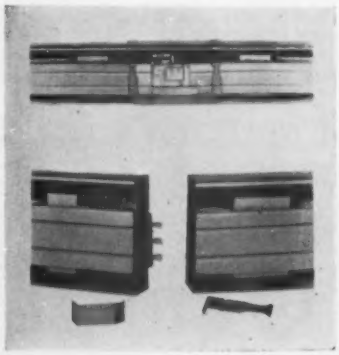
Baseboard sections and accessories are finished in soft beige and may be painted to match any color scheme. No preliminary sanding is required.

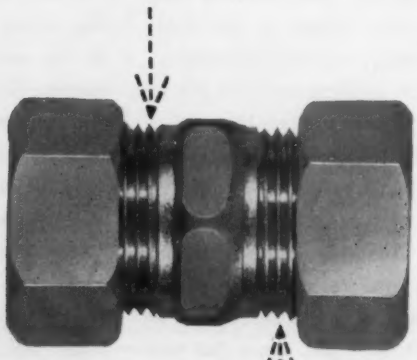
For additional data, ask for item P-817, using the coupon on page 119.

Electric perimeter heater consumes less current

A NEW EXCLUSIVE plug-in type Electric Convection Perimeter Heater, known as the Meier Tandem 500, is now available from the Meier Electric and Machine Company, Inc., 3525 East Washington Street, Indianapolis 7, Indiana.

The heater is composed of a thermostat section or a starter sec-





Full perfect threads

work faster and easier

BLACKHAWK EMT FITTINGS have full, true, perfect threads for ease and speed of installation. Bodies of heavy steel — cadmium and zinc finished to eliminate corrosion on the unit itself. Blackhawk's new EMT fittings are rain tight. Quality controlled at every phase of the manufacturing. In demand for electrical jobs large and small because they're easy to use.

Blackhawk's new EMT fittings are a product of continuing Blackhawk research and automated methods of manufacture. Order a stock today to meet the demand for these quality made, EMT fittings. A complete range of sizes is now available.

Blackhawk Industries

Blackhawk Industries, Dubuque, Iowa

Where the new ideas come from

tion, heater section (as many as are needed for the perimeter of the room) and inside corner sections. The current connection to the unit is made through the thermostat or starter section. All subsequent sections plug into each other as they are affixed to the wall. There are no parts to disassemble for installing, and it is completely wired at the factory.

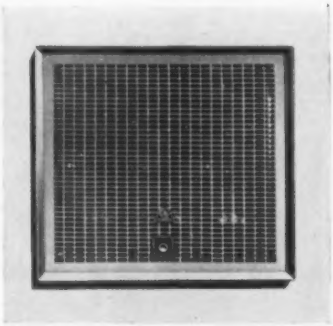
The heater is safe for small children because the front surface temperature is 113 degrees F. The thermostat maintains floor temperature at 2 degrees differential.

For additional data, ask for item P-818, using the coupon on page 119.

New line of recessed wall heaters offered

A RECENT ENTRANT in the electric heat field is the Hunter division of Robbins & Myers, Inc., 2500 Frisco Ave., Memphis 14, Tenn. Among its products are recessed wall heaters and bathroom heaters.

The R&M-Hunter wall heaters have beige screens highlighted by trim of anodized gold. The five



models of radiant-convector wall heaters range from 5,120 to 13,600 BTU an hour.

Cradled coil heating elements, guaranteed five years against burnout, are said not to sag and develop hot spots. Thermostat and switch are combined in a single unit. Heaters are factory assembled for fast installation by contractors and are designed for flush mounting in standard walls.

R&M-Hunter's bathroom heater models are being supplied in either 120 or 240 volts. Switch is of the off-on toggle type and the finish is chrome. Only 8⅜ inches wide, these models also mount flush to the wall.

For additional data, ask for item P-819, using the coupon on page 119.

Space requirements reduced by new heat pump system

THE GENERAL ELECTRIC Air Conditioning Department, Bloomfield, New Jersey, has just announced the availability of its new Weathertron line of heat pumps in which the air handling section installed in the house represents a saving of space three times that of former heat pump models. This model brings to a total of twelve the selection that the company now offers.

The new Weathertron heat pump system is extremely flexible and of-

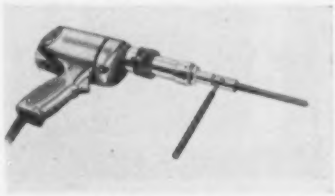
fers many new economies to the builder and the home owner. Installation costs have been noticeably reduced for application in existing buildings. Air circuits for in-door and out-door sections have been simplified, and special installation systems and procedures have been eliminated. Service and maintenance have also been made simple.

Measuring less than two by two feet in size, the indoor blower system of the new Weathertron split system with its heating and cooling element accounts for less than 25 per cent of the space previously taken by earlier models. It utilizes unique design for direct up-flow, horizontal or down-flow without need for special metal extensions or mechanical changes. It is of a single unit design suitable for every application—and only 21¼ inches high.

For additional data, ask for item P-820, using the coupon on page 119.

Electric hammer is light, easily adjustable and fast

THE MILWAUKEE Electric Tool Corporation, 5368 West State Street, Milwaukee 8, Wisconsin, has announced a new powerful, light weight hammer



with adjustable blow for fast, easy hammering of holes up to ½" in diameter in concrete, for tuck-pointing, chiseling, channelling, etc. It can be used with masonry drills for rawl plugs or expansion shields and other fasteners and anchors or with cold chisels, mortar chisels, etc.

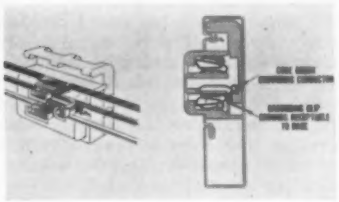
Hammer impact is quickly and easily adjustable from light to heavy blow as required. Force of blow is maintained as adjusted.

The electric hammer is useful in building maintenance, plumbing, heating and air conditioning, floor work, re-glazing steel sash and skylights, electrical work, sign hanging, and many other jobs.

For additional data, ask for item P-821, using the coupon on page 119.

New receptacle provides dual electrical grounding

A NEW RECEPTACLE providing dual electrical grounding has been made available in Baseduct wiring systems by the manufacturer, National Elec-



tric Products Corporation, Gateway Center, Pittsburgh, Pa.

The new receptacle design incorporated in Baseduct is the first multi-outlet assembly offering two positive grounding features. The receptacle is rated at 15 amperes, 125 volts.

To achieve positive continuous conductor grounding, National Electric has provided the NEMA-type receptacle with a code green grounding conductor. This conductor is continuous from feed to termination point. All conductors are No. 12 AWG copper. The second ground is similar to that used on National Electric's "Plug-In" Strip.

The new grounding-type receptacle of molded plastic is fabricated with a brass clip circling the grounding conductor and protruding through the back. As the receptacle is rotated into position the pointed edges of the brass clip scrape against the steel channel of Baseduct, making an electrical ground connection. Lengths of duct are butted when installed. A grounding-type coupling assures continuous system ground.

For additional data, ask for item P-822, using the coupon on page 119.

Portable baseboard heater is new in perimeter heat

FOUR NEW HEETAIRES—including a new portable Baseboard Heetaire—have been added to the new 1958 line of heaters designed and manufactured by Markel Electric Products,

Inc., and LaSalle Products, Inc., 145 Seneca St., Buffalo, N. Y.

The new portable automatic Baseboard Heetaire (Model 24T—1500 watts) is a new interpretation of portable electric heat and perimeter heat. The "sealed-in-steel" heating element is guaranteed for 5 years. It has over 1800 square inches of finned heating surface. The case is finished in beautiful coppertone and beige with brass control plate, and has a retractable carrying handle and a guide light.

For additional data, ask for item P-823, using the coupon on page 119.

Split bus panel is designed for electrically heated homes

A NEW 200 AMPERE split bus panel designed for homes with electric heating has been announced by Federal Pacific Electric Company, 50 Paris Street, Newark 1, New Jersey.

Part of the company's Stab-lok circuit breaker and enclosure line, the 200 ampere main lug panel provides four useable, 2-pole circuits and twenty additional circuits behind a 100 ampere, 2-pole main breaker.

A typical installation would consist of four 240 volt circuits for home services like electric dryers, ranges, air conditioners, etc.; six 240 volt circuits for heating; and eight 120 volt

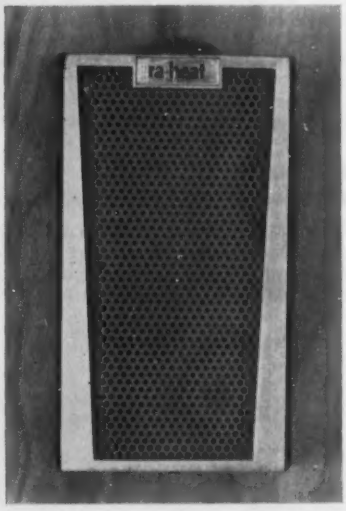
circuits (15 and 20 amperes) for lighting and other home services like electric washers, convenience outlets, etc. Additional lighting circuits can be secured by reducing the number of 240 volt circuits.

Like other Stab-lok panels, the 200 ampere split bus panel features a removable interior, ample knockouts and wiring space, and front door accessibility with provision for locking. The enclosure can be mounted either flush or surface, and is protected by light gray, baked-on enamel, attractive enough to be used by itself or else as a base for further painting to match a home's decorative scheme.

For additional data, ask for item P-824, using the coupon on page 119.

Thermostat produced in four models, from 15 to 30 amperes

TENNESSEE PLASTICS, Inc., 204 E. Maple St., Johnson City, Tenn., designers and manufacturers of elec-



trical heating equipment, have introduced the new Ra-Heat thermostat in which efficient engineering is combined with homeowner acceptability.

Housed in a handsome brushed chrome case, the Ra-Heat thermostat has an easily removable face panel which can be painted to match any color scheme. Ventilation on all sides allows covering of the face panel with drapery or slipcover material without hampering the sensitive bimetal element.

The Ra-Heat thermostat is produced in four models, from 15 to 30 amps. All are the same size and design, permitting a homogenous installation. Range is 34 to 86 degrees F.; temperature differential is ½ degree F.; switch is fast-action; cycling rate is 5 to 9 per hour; dimensions are 4¾" high, 2¾" wide and only 1 3/16" deep.

For additional data, ask for item P-825, using the coupon on page 119.

Sod cutting attachment available for trencher

THE CHARLES Machine Works Inc., 633 Birch St., Perry, Okla., has announced its new 1958 Model M-2 Ditch Witch trencher.

Features include new 8" width trencher to 30" depth—also 6" x 36",

4½" x 36" and 3" x 48". New speed reduction unit with "Select-O-Matic" shift from digging speed to mobile speed provides four speeds forward and reverse.

Among the new optional features available is a sod cuting attachment. This attachment can be mounted on the trencher in minutes, cuts an 8" sod strip at speeds up to 40 F.P.M. After trenching and backfilling sod can be replaced, leaving turf with an "untouched" look.

For additional data, ask for item P-826, using the coupon on page 119.

3-way switch offers alternate control

A 3-WAY A-C SWITCH which also offers alternate control of two circuits, and can handle up to eight #12 or #14 wires, is now available from the Slater Electric & Mfg. Co.,

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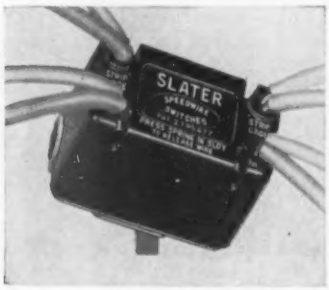
Inc., Glen Cove, N. Y.

Designated the Slater #608, the stock switch can be used as an SPST for two-circuit operation (one side on, the other off), as well as a single-circuit SPST and 3-way switch. 3-



way operation is accomplished by the external connection of two end terminals. Thus, an additional circuit and many wiring changes can be accommodated without having to replace the switch.

The #608 features speed-wire insertion and patented split-second release (Pat. No. 2,795,677) for all eight wires. It is also made with standard screw terminals. Rated at 20 amp, 120-277 volts, the switch is available with interchangeable type mounting straps or standard wall type mounting straps.

For additional data, ask for item P-827, using the coupon on page 119.

Free bulletins

Sixty-four pages of detailed information, technical data and prices on all types of **automatic electrical control equipment** are included in a new brochure available from **Zenith Electric Co.**, 152 W. Walton St., Chicago 10, Ill.

For additional data, ask for item B-828, using the coupon on page 119.

A sixty-page loose-leaf catalog containing latest information on their complete line of **cable supporting systems** including cable trough, cable ladder, cable channel, and Rak-it system supports and accessories is available from **T. J. Cope** Division, Rome Cable Corp., 3rd and Walnut St., Collegeville, Pa.

For additional data, ask for item B-829, using the coupon on page 119.

Hundreds of interesting facts on the **measurement of time** down through the ages and into tomorrow are presented in a cartoon story booklet from **Paragon Electric Co.**, 1618 12th St., Two Rivers, Wis.

For additional data, ask for item B-830, using the coupon on page 119.

A comprehensive description of **secondary unit substations** from simple radial systems to secondary selective systems is contained in a new bulletin released by **Allis-Chalmers Manufacturing Co.**, 938 South 70th St., Milwaukee 1, Wis.

For additional data, ask for item B-831, using the coupon on page 119.

Hints for electrical cable buyers on selecting the proper **cable construction** are contained in the new 20-page booklet, just released by **The Okonite Co.**, Passaic, New Jersey.

For additional data, ask for item B-832, using the coupon on page 119.

A condensed catalog listing their entire line of **tapes and adhesives** has just been released by **Permacel-Lepage's, Inc.**, of New Brunswick, N. Y.

For additional data, ask for item B-833, using the coupon on page 119.

The Peerless Electric Co., 1401 W. Market St., Warren, Ohio, has recently published a new catalog on their non-overloading Class I **direct drive blowers.**

For additional data, ask for item B-834, using the coupon on page 119.

Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill., offers a useful sixteen-page booklet on aluminum **electrical building wire.**

For additional data, ask for item B-835, using the coupon on page 119.

Fuse products of **Monarch Electric Corp.**, 118 East First St., Jamestown, N. Y., are graphically presented in a new 8-page catalog available from the company.

For additional data, ask for item B-836, using the coupon on page 119.

Operating characteristics and operating economies as well as the color characteristics of currently available **mercury vapor floodlights** are discussed in an eighteen-page bulletin from the **Pyle National Co.**, 1334-58 N. Kostner Ave., Chicago 51, Ill.

For additional data, ask for item B-837, using the coupon on page 119.

Silvray Lighting, Inc., 100 W. Main St., Bound Brook, N. J., is offering a bulletin on three new types of **indirect luminous ceiling fluorescent fixtures.**

For additional data, ask for item B-838, using the coupon on page 119.

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(August 1958)

"Sportslighting for Night Football" is the title of a new 8-page bulletin offered by **Crouse-Hinds Co.,** Syracuse 1, N. Y. The bulletin highlights the advantages of floodlighting for football, and features sportslighting layouts based on IES recommendations.

For additional data, ask for item B-839, using the coupon on page 119.

Century Electric Co., 18th and Pine Sts., St. Louis 3, Mo., has issued a twelve-page **motor application guide,** designed to make motor selection easy.

For additional data, ask for item B-840, using the coupon on page 119.

A pocket-size handbook and catalog of anchoring and drilling **devices for fastening anything to masonry** is offered by the **Rawplug Co.,** 250 Petersville Rd., New Rochelle, N. Y.

For additional data, ask for item B-841, using the coupon on page 119.

Superior Electric Co., 83 Laurel St., Bristol, Conn., has just issued a 100-page reference bulletin describing their line of Powerstat **variable transformers.**

For additional data, ask for item B-842, using the coupon on page 119.

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KING MFG. CO. INC., JAFFREY, N.H.

Fundamentals of **selective short-circuit protection for motor circuits** are covered in a new eight-page bulletin by **I-T-E Circuit Breaker Co.,** 19th and Hamilton Sts., Philadelphia 30, Pa.

For additional data, ask for item B-843, using the coupon on page 119.

The latest specifications on the number of conductors permitted in each **size of conduit** or tubing are reported in a new technical guide published by **Clayton Mark & Co.,** 1900 Dempster St., Evanston, Ill.

For additional data, ask for item B-844, using the coupon on page 119.

A complete line of moisture and dust proof **enclosures and troughs** are described in a new bulletin available from **Metaltite Products, Inc.,** 6810 McCook Ave., Hammond, Ind.

For additional data, ask for item B-845, using the coupon on page 119.

Training course

(Continued from page 37)

This course of instruction is one of the best practices we have ever instituted. Our apprentices look upon it as invaluable in supplementing experience they get in the field and in clarifying and applying the Code.

New mechanics report they appreciate being drawn into the organization with a more comprehensive picture of all aspects that bear on their jobs. Older mechanics keep up with current changes as their point of view is refreshed and learn of new developments in the industry. Furthermore in the exchange of ideas, they have much to pass on to our new young apprentices.

Do-it-yourself fad

(Continued from page 93)

so? All he has to do is go to the corner variety store and buy a switch and some wire.

I deplore the lack of control over this kind of "public education." It is not only misleading but inviting hazards to "teach" the home owner how to do his own wiring installations and repairs. The average home owner is ignorant of the years of apprenticeship an electrician serves before he is eligible to take a written examination for licensing. He knows nothing of wiring regulations, the Code requirements, the bonding of an electrician, inspections, etc. He has been deluded into thinking anyone can wire.

I would like to see some recognized and authoritative body like the National Electrical Contractors Association move to restrain such "practical hint" writers. Often they cover themselves with a fine print notation at the close of the article like "consult your electrician before proceeding."

I have been called in to straighten out some of the difficulty home owners have become involved in while trying to do their own wiring. Sometimes the wrong wiring material has been bought and cut up, therefore no longer usable, or the size of wiring did not comply with the Code. The job has to be redone and the home owner resented having to put out additional money to have his work corrected.

On occasion when I have read a column on how easy it was to do your own wiring, I sent a letter to the publication pointing out it was misinforming the public. It does more than that. It is unfair to the electrical industry; it is damaging to a highly skilled occupation with recognized standards of performance regulated to protect the public. That is why I think some responsible group should take it upon themselves to caution the public on trying do-it-yourself wiring and restrain writers from misleading them.

Lighting for bowling

(Continued from page 38)

Vile states, "has not only caused comments of the highest caliber from many of our local customers, but also from the champions who bowl on our TV show on Saturday nights. They say that they have never seen anything to top this in lighting for a bowling lane.

"We believe," he adds, "that the high level of lighting has helped to bring us the new customers we are getting from many sections of the Midwest."

The 22 lanes at Pla-Mor under the General Electric Power-Groove lamps occupy a space formerly used as a ballroom. Pla-Mor operates an additional 32 alleys on the lower floor of this building.

Designed and installed by the Boese-Hilburn Electric Co., Kansas City, Mo., the new system consists of 100 fixtures, each of which houses two Power-Groove lamps. The fixtures are grouped in banks of four and are suspended by brackets which are adjustable to compensate for the arched dome of the ceiling. Suitable lighting fixtures are available from several manufacturers.

The entire system operates from

two circuit panels. For league bowling only half are burned, producing 100 footcandles. The circuits are used alternately day by day as a measure to reduce maintenance costs.

For professional tournament bowling, which is a televised feature every Saturday night, all lamps are lighted to achieve a 200-footcandle level.

The center lanes used for tournament bowling have six additional fixtures suspended over the approach zone for the benefit of television. No auxiliary lighting is required for the telecast when using the Power-Groove.

Incandescent dome fixtures are used over the bowlers' seating area and over the approach zone. These are suspended to a height of twelve feet above the floor. The foul line is lighted by units recessed into the false bottom of the overhead air-conditioning duct.

Large urns on the sidewalls, which furnished atmosphere in the days when the space was used as a ballroom, are equipped with amber lights to provide color accents.

Liability for wiring

(Continued from page 60)

ing to the milking-machine, and their admitted familiarity as electrical men that lightning could cause such damage to the wiring, charges defendant through its employees with knowledge 'that when lightning caused the transformer and fuses to blow it could have caused other damage as well'; and consequent to such actual or presumptive knowledge of the potentially hazardous damage to plaintiff's wiring, defendant's agents were under a duty not to simply turn on the current and go on their way without warning, waiting, inspection, or any precaution or notice whatsoever for or to their customer of what turned out to be an actually—rather than merely potentially—hazardous condition of the wiring.

"Because of this specialized knowledge, we do not find persuasive defendant's argument that upon replacing the charred fuse and seeing the milking - machine commence operating, defendant could not reasonably anticipate the defective condition of the wiring."

In a supplemental opinion, The Court of Appeals said:

"It was not our intention to hold that liability attaches simply because the company's employees had changed the burned fuse and inserted a new fuse as an accommodation to its customer. * * *

"Had the replaced fuse been simply burned out, such as might have been compatible with a normal cause such as an overload on the line, then we do not think that the electric company's employees were under any duty to anticipate equipment or wiring so defective, that their resumption of electrical service by replacing the fuse might cause damage to plaintiff's property. But under all the circumstances of this case, the fuse replaced by defendant's employees was burned and charred to such an extent that defendant's employees (with their specialized knowledge) were put on notice of the good probability that the wiring had been damaged beyond the fuse by a surge of lightning, and that because of this it was dangerous to resume electrical service; and therefore, as a consequence of this presumed knowledge, the replacing of the fuse permitting the resumption of electrical service to plaintiff's milking machine circuit without taking some safeguarding precaution or warning plaintiff so as to enable him to take same, constituted actionable negligence imputed to their employer, the defendant."

Parade of Homes

(Continued from page 19)

Rench added. "The heat loss and all is engineered by the Commercial Department of Knoxville Utilities Board. It is a service they render without charge to builders in this area. They cooperate with us in every possible way and give good service. If a special installation is planned, as for a heat pump, etc., they will make layouts.

"Electric heat is the most economical in this area. I would estimate that 98 per cent of all new homes have electric heat.

"Public sentiment is for it. If you don't have some form of electric heat you have a sales objection to your house. One of the big factors in electric heat is the load of work it takes off the housewife. You don't have a movement of air like you do with other types of heat, so walls, furniture and draperies stay cleaner. There are

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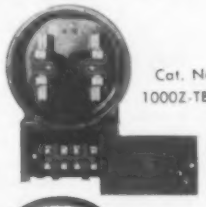
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less redecorating costs. It is a lot easier to sell an electric home.

"The key to electric heat is proper insulation. You should insulate your floor, sidewalls and ceiling. One of the special requirements for using electric ceiling heat is that you have six inches in your ceiling. Insulation not only helps in the winter, but in summer insulation in the ceilings dissipates attic heat. All my homes are comfort-conditioned too."

Rench sold eight homes in the Parade of Homes last year and all had electric heat.

Standards are high for electric homes, often higher than in some other parts of the U. S. Many builders were already meeting the requirements set by the electric industry for a Medallion Home.

Usually a house with 12½kw or more of electric heat has a 200 amp meter center. Other houses, requiring 11.6 kw of heat have a 100 amp center.

Among the interesting installations on the 1958 Parade is one by DeArmond Electric Co. for Mullendore & Co., builders. William W. Mullendore explained it:

"It is a combination of electric heat—electric forced air heat and air conditioning. The economy of it is that since it is a combination unit you get your air condition more economically if you put it in at the time you build your house. There is no heat loss due to travel through ducts because all the heat originates at the unit. It practically eliminates condensation, which has always been a problem with any dead heat—heat not circulated. From past experience, operation of it has been very economical, with a minimum of gobacks.

"Two-ton air conditioning or 24,000 BTUs cooling capacity are used. The heating capacity varies in the heating units, by different size wires, from 12kw on up to 24kw, which would catch about any residential house. This one is a 12kw.

Installation in older houses

"The installation is adaptable to older houses and in many cases only necessitates putting in a false ceiling 10½ inches below the original ceiling, and this is what is known as a plantum chamber. It is exhausted out into each room over the doors with a controlled louvre or register. A 24-inch square metal chimney sits on the roof and the air is drawn in from the outside and forced over the cooling coils. No water tower is built. There's a switch on the thermostat that you can operate for heating and cooling. Set it and it will stay within 2 to 3 degrees of what it is set on."

Mullendore said the cost of installation was about $100 and the system cost about $900 to the builder. "Roughly, that is what it is on this unit (in the home he showed)," he said. "On bigger houses the cost would be more, due to the heavier wire."

That particular home was six rooms with a bath and a half, with total of 1226 square feet.

J. B. Smith was the electrical contractor on a job for W. C. Dawn, who also stresses the importance of proper insulation. On a new six-room house, with two baths, the heating cost per year was estimated at approximately $1 per 100 square feet per month.

Bradley Dean, of Dean & Co., was pleased with the ceiling heat in homes he built. Reynolds Electric was the electrical contractor.

C. H. McSpadden, president of the Home Builders, is among those with new homes in the 1958 Parade and he has found KUB helpful.

All the Parade homes are not only electrically heated, but are adequately wired, with planned kitchens and laundries.

"There is a definite trend toward electric heating," says Jack Goans of KUB. "At first people were skeptical until they found the many advantages.

"Where the home is properly insulated and the required capacity is installed, electric heat has proved most satisfactory. The trend is catching on even in the larger commercial and industrial buildings.

"Approximately 20,000 homes in the Knoxville area are completely or partly heated by electricity now and a large majority of local electrical contractors install electric heat.

"In 1940, the 60-amp entry switch was the most popular. However, since electric heat has attained such high popularity, the lowest entrance switch allowed on electric heating is 100 amp and for all over 12 kw heating a 200 amp switch is required for a normal job.

"Another popular method of heating gaining wide reception among the new and older homes is the heat pump. Since the first one manufactured in 1930, the popular reception has increased the number to several thousand throughout America. In Knoxville there are now over 120 heat pumps and the number is increasing daily.

"The low cost of TVA electricity provides a satisfactory means of heating by any method using electricity, especially the heat pump. One advantage of the heat pump is that it provides both summer cooling and winter heating, which allows the home owner to enjoy year-around indoor comfort."

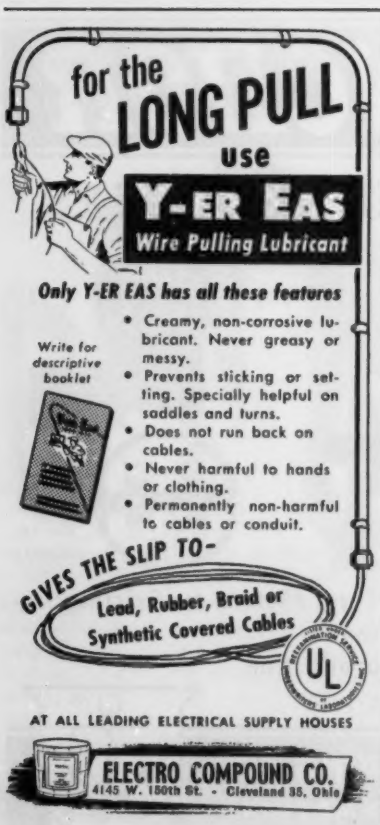
Heating estimator

(Continued from page 25)

of each room (watts), the heat loss figures for all rooms should be totaled and divided by the temperature difference. This establishes the heat loss (watts) per degree.

In our example of the Macon house used above, let us assume the total heat loss of this six room home is 9,510 watts. When that figure is divided by the temperature difference in Macon—55—the heat loss per degree is 173.

By setting the figure 173 under the top arrow we can determine the thousands of KWH per heating season by merely looking at the figure directly above the annual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degree-days in Macon. The chart shows that Macon has 2049 degree-days. The KWH which corresponds to 2049 is 6.5 KWH.

The final step is to set the figure 6.5 under the arrow in the panel immediately below. The rate per KWH in Macon is 1.6¢ and reading from the slide above the figure 1.6, the annual cost for heating this six-room electrically heated home in Macon will be approximately $104.00.

The electric heat contractor or the public utility representative who uses the R&M-Hunter Estimator will recognize that some winters may be more severe than average and that individual living habits of the occupants in using the heating system may cause some variation between estimates obtained by using the R&M-Hunter slide-chart and actual job results.

However, data given by the Estimator will usually be on the conservative side. Under most favorable conditions, actual costs may be reduced by more than one-third. This is due to the fact that the NEMA estimate of 18.5 operating hours per day is built into the slide calculation. This assumes the most unfavorable operating conditions.

The future of the electric heat business is dependent upon accurate figuring of heating requirements for each individual installation as well as the equipment and good insulation. It is for this reason we have introduced the Estimator. The slide-chart is for any electric heat contractor, regardless of the make product he handles, or for any electric utility company.

Quality electric heat products plus selection of the proper capacity equipment for each job can bring only goodwill for the electric heat industry. With the goodwill of each satisfied customer, the electric heat field has no horizon.

Power transformers

(Continued from page 44)

voltage, and impedance, but also allows the introduction of design improvements by the manufacturer.

Optimization of Preferred Design transformers is another advantage resulting from the use of the computer. By optimization is meant determining what design best satisfies a certain desired characteristic such as minimum weight, minimum cost, or minimum sound level while still meeting all the guaranteed specifications. Since it is generally possible to make several designs which meet the guarantees, there is no assurance that any one is the best unless all possibilities are tried. With hand-design methods time will normally permit making only one workable design, but with a computer all that are necessary can be made.

Improved accuracy is obtained by employing more rigorous, detailed, and complicated calculation procedures than are possible to use by hand-design methods. With a computer it is possible to determine such quantities as reactance, eddy loss, and stray loss with greater accuracy than ever before attainable.

Time saving with the computer, combined with an overall standardization program, has made it possible to reduce the delivery time for PD transformers by six to twelve weeks. Also important is the fact that by saving engineering time, it has released many men for work on new developments which will improve the transformers of the future.

High voltage load-tap-changing

When applying load-tap-changing equipment to transformer windings in the higher voltage classes, it is common practice to primary winding of the series unit utilize a series transformer. The is connected in the high voltage circuit and insulated accordingly. The secondary winding is connected into a relatively low voltage tap-changing circuit. Thus it is unnecessary to insulate the tap-changing equipment for high voltages to ground — a difficult problem for the contactor which operates in oil carbonized by arcing. Figure 6A shows the circuit for a typical autotransformer with load-tap-changing in the high voltage winding and with a series transformer employed.

A new development makes it possible to place load-tap-changing equipment in the high voltage winding of a transformer without need for a series unit. This development consists of a bushing-mounted contactor. Figure 4 is photograph of such a contactor applied to a large autotransformer.

The oil-immersed contactor is mounted in its own tank, which is supported by a separately filled porcelain bushing which has its own oil preservation system. The oil carbonized by arcing is confined to the contactor tank, which

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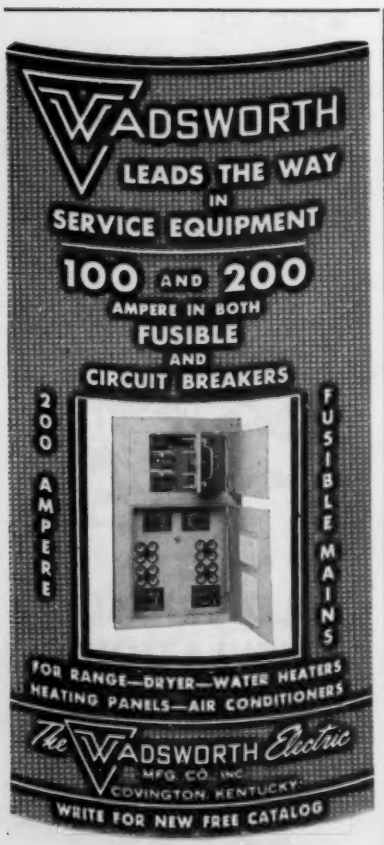
is vented to the air. The insulation which is subject to high stress to ground consists of porcelain, clean oil, and air. The tap selector is mounted in the transformer tank near the windings, allowing short, convenient high-voltage lead connections and eliminating the need for a high-voltage, oil-tight terminal board.

The contactor and tap selector are connected by insulating shafts to a motor drive which is mounted on the side of the transformer tank.

Figure 6B shows the circuit for the same autotransformer except utilizing the bushing-mounted contactor. (The question might arise as to why the load-tap-changing equipment is not placed in the neutral end of the autotransformer. This would have the effect of regulating the voltage of other windings, in addition to the one desired.)

The obvious advantage of the bushing-mounted contactor is the elimination of the series transformer which adds weight, size, losses, and reactance to the power transformer. It is also apparent that it is uniquely adapted to autotransformers because the same bushing which mounts the contactor can also serve as a line bushing. Consideration of these advantages and economic factors dictate the choice of load-tap-changing equipment for a given application.



Gas insulated transformers

Oil as an insulating and cooling medium has made possible the development of modern power transformers. In most transformer applications it is entirely satisfactory. However, because of the possible fire hazard, fire underwriters prohibit the use of oil-immersed transformers in certain locations unless they are installed in expensive fireproof vaults.

A gas insulated transformer offers the following advantages:

a. The gas is non-flammable and non-explosive.

b. Should a failure occur, the pressure developed in a gas-filled transformer is only a fraction of that developed in a liquid-filled unit.

c. Quieter operation: In liquid-filled transformers, one of the main paths for vibrations from the core-and-coil structure to the outside is through the insulating fluid. In gas-insulated transformers, this transmission path is poor.

d. Lighter weight: A 2000 kva liquid-filled unit requires about 10000 pounds of oil, whereas only about 200 pounds of gas are required for a gas-filled unit of the same rating.

The problem of selecting the gas required the evaluation of numerous possibilities. Of the gases readily available, sulfur hexafluoride (SF_6) was chosen because it has desirable dielectric and thermal properties in addition to being non-toxic.

Under moderate pressure, and with proper conditions, SF_6 has dielectric strength which compares favorably with oil. Moreover, SF_6 is a heavy gas with relatively high thermal capacity. With forced-gas cooling, it is possible to dissipate heat at rates equal to those on forced-oil-cooled transformers.

At present, gas-insulated transformers are filled with sulfur-hexafluoride gas under pressure of 15 pounds per square inch gage at 25°C. The external construction is shown in Figure 7. Cooling is accomplished by blowing gas at high velocity through the transformer's windings and core ducts. Circulated by axial blowers, the gas dissipates its heat through suitable heat exchangers.

In 1957, two 2000 kva, 60 kv, gas-insulated power transformers were shipped to the Consolidated Edison Company of New York. Orders have since been received from three other users. The Pennsylvania Power and Light Company has purchased a 10000 kva, 69 kv unit; the Houston Lighting and Power Company a 9375 kva, 69 kv unit; and the Detroit Edison Company one rated 7500 kva, 46 kv. The latter two units will be equipped with load-tap-changing equipment.

The outlook for gas-insulated transformers is good. The present design fills a need in the industry, and the possibility of going to higher pressures offers potential increases in dielectric strength and cooling capabilities in units of the future. In addition, the availability of gases with even better insulating characteristics than SF_6 is being actively investigated, and will undoubtedly result in transformers of even greater capacity than now possible.

Code discussion

(Continued from page 81)

To illustrate the intent, I will quote first the section as written and then re-state it in an effort to separate more clearly that part which is mandatory from the other part which is permissive. The section as written: "Types Permitted. The disconnecting means for ungrounded conductor *may* be a manually-operable switch or circuit-breaker of the air-break or oil-immersed type, equipped with a handle or other suitable operating means, positively identified and marked, for mechanical operation by the hand." (Italics added).

As re-stated: Types Permitted. The disconnecting means for ungrounded conductors *shall* be positively identified and *shall* be of the manually-operable type equipped with a handle or other suitable means for mechanical operation by the hand. It *may* be a switch or a circuit-breaker of the air-break or of the oil-immersed type.

That the manually-operable feature is intended to be mandatory is indicated by the fine print note following the section which states, "A push-button type of electrical remote control may be used in addition to the manual handle."

Further proof of this intent is found in section 2392 which states, "If the primary service equipment supplies one or more transformers

whose secondary windings feed a single set of mains, and the primary circuit-breaker is *manually-operable* from a point outside the transformer vault, the disconnecting means and overcurrent protection may be omitted from the secondary circuit, provided the setting of the primary circuit-breaker is such as to protect the secondary circuit. In all other cases the secondary circuit shall be provided with a disconnetcing means and overcurrent protection as required by various paragraphs of this article." (Italics added). This section is also followed by an explanatory note which states, " 'Manually operable' calls for a mechanical, rather than only electrical, linkage between the circuit-breaker and the point of operation, and refers to both the opening and the closing operations."

There is no doubt about the requirements for service disconnecting means to be externally operable and to be of the indicating type. Unlike the provisions discussed above, these provisions are clear enough, and the mandatory term, "shall" is used in both instances.

Service switch size

The minimum rating of the service switch is a frequently debated subject. Some Code-making authorities contend that to increase the present minimum at this time would be a step beyond the bounds of that which is actually needed from a safety standpoint and, they contend, any action in that direction is a promotional function rather than a safety precaution.

Other Code-making authorities take the opposite stand and point to the manifold increase in the number of appliances and to the ever increasing current-consumption of the newer models of appliances as proof of the need from a safety angle for larger services. Some such authorities go a step further and mention the increasing probability of adding future loads to existing installations with resultant overloads and safety hazards.

This latter argument is refuted by the first group as being a problem for the future and cannot be taken as a present need. I personally think that at the present rate of growth, the future will soon rush down our bottle necks.

In any case, the present minimum is a 60-ampere switch or a 50-ampere breaker, or the equivalent in multiple switches or multiple breakers, with a 30-ampere minimum permitted for an installation consisting of two 2-wire branch circuits.

With the exception of a few isolated cases, however, such as Sno-Cone stands and small billboards, most modern services should be larger than the 60-ampere minimum, and the electrical contractor, in my opinion, would be doing his customer a favor if he installed nothing smaller than a 100-ampere service.

Most residents of Mortgage Row either already have or intend to get electrical appliances with ampere ratings unheard of a few years ago, such as combination refrigerators and deep freeze units which spin watt-hour meters more revolutions per month than ranges formerly did. Even on Poverty Knob, electric ranges and TV sets are not uncommon.

In the next issue we will discuss services exceeding 600 volts and begin a discussion of Article 240 on Overcurrent Protection.

Answers to Code test questions are as follows: (1. F section 2358) (2. F sec. 2353) (3. F sec. 2356) (4. T sec. 2359 & note following 5051) (5. T Note following sec. 2371-a-4) (6. **a** sec. 2371-c) (7. **a** sec. 2372) (8. **c** sec. 2373) (9. **b** sec. 2374) (10. **b** sec. 2382-c)

Georgia space heating

(Continued from page 23)

A true comparison between fossil fuels and electric resistance heating is difficult because the latter is so far superior to the former. Electric heating does such a better job when thought of in terms of comfort, convenience, and satisfaction. Maintenance costs are lower, life of the equipment much longer, safety, lack of any residue, lack of noise, low first costs, reduction in air conditioning cost due to insulation installed for heating, makes this method of heating stand head and shoulders above its competition.

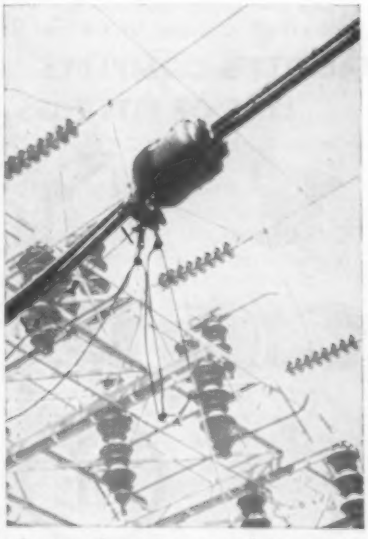
When costs of operation are compared, Mr. Yopp believes this gives the electric heating proponent a definite edge. "Tell the story of insulation and electric heating with the greatly decreased heat requirements for a given home properly insulated and heated with electric heating units. Explain about the impracticality of insulating homes heated with fossil fuels to the degree used in electrically heated homes because of the odors as well as the possible danger from carbon monoxide gas.

"Detail the startling efficiency of electric resistance heating in converting kwh to B.T.U.'s and contrast that with fossil fuel systems with their low efficiency of conversion, not 80% as advertised, but nearer 60% in actual use over a season due to intermittent operation, collection of soot, improper amounts of air, infrequent cleaning of burners, etc. In addition, emphasize the transmission losses in ducts and grills on the order of 20% in fossil fuel systems.

"Follow this up with the ability of electric resistance heating to heat only those rooms requiring heat without having to heat the whole house to heat one room. This is a fuel savings of at least 15%, compared to our competitors' systems. Don't forget to bear down hard on the comfort of temperatures controlled to less than one degree for all rooms, compared to a central thermostat with its wide temperature variations all over the house."

What Georgia Power is doing

Georgia Power Company is selling electric resistance heating



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along the lines already mentioned above, and, of course, it is also promoting the heat pump as well. The market is new and selling is still in the experimental stage for company officials. However, they have devised a thorough selling program.

Pitfalls to be avoided

Three pitfalls should be avoided in setting up a selling program: (1) setting operating cost estimates too low; (2) reducing the formula for insulation below the tested 6-4-2 formula in order to make a sale; and (3) displaying too little confidence in electric space heating.

Advertising to date has been moderate, however, plans are now set for more next year. Last year, six quarter-page ads were run in fourteen daily newspapers located in cities headquartering divisional offices. In addition, a large billboard on one of the main streets in each of these cities was used.

Commercial electric space heating has been and will be featured in two professional magazines: *The Georgia Engineer* and the *Professional Engineer* with a full page ad appearing in each monthly issue.

During the past few months, Georgia Power Company bought space for a quarter-page ad in the local newspaper when a new store, electrically heated, opens for business; placed appropriate signs wherever a commercial electric heating job was sold for a new building; and placed features regularly in the company publication, *Spotlight*, issued to all commercial customers of appreciable size.

Georgia Power Company has a policy of substantially helping subdivision builders finance their sales campaigns if electric resistance heating or heat pumps are installed. Usually 40% of their sales campaign costs for advertising is contributed and sales personnel at open houses are provided to push electric heating and all-electric living.

The company works closely with electrical heating manufacturers, manufacturers' representatives, electrical wholesalers, electrical and mechanical engineers and contractors, as well as architects. In their contacts with manufacturers and their agents, they urge them to aggressively push electric space heating as a very profitable source of income and suggest they take on electric space heating lines if they do not already have them.

The company tries to bring manufacturers and agents together for their mutual benefit, and trains wholesalers' salesmen as well as manufacturers' agents in the fundamentals of electric heating and electric space heating costs. Their sales engineers actively develop contacts with architects and engineers to sell them on electric space heating, using new buildings as the focal point for this contact.

The company is encouraging the establishing of permanent displays of electric space heating equipment in the Architects and Engineers Institute, headquarters in Atlanta for these professional architectural and engineering societies. Each of these groups holds its meetings there, and for the information of the membership, all kinds of electrical, mechanical, and structural equipment for the use of architects, engineers, and their clients is displayed.

Georgia Power Company has a policy directing the use of electric space heating in all new buildings that they build or rent. Existing buildings are being converted as fast as it is feasible. All of their present offices and stores will be using electric heating before long.

They are now building two out of four buildings as a service center just outside Atlanta. All four of these buildings when completed will be heated electrically. Thirty-thousand square feet of air conditioned office space will be serviced by an 85-ton, air-to-water heat pump.

Over a hundred thousand square feet of warehouse space will be heated by electric resistance blower heaters. A forty thousand square foot garage will be heated by electric resistance blower heaters and by electric resistance cable in the concrete floors. About one-third of the heating capacity is in the floor cable. All of these buildings will be sub-metered so that studies of the energy used and demands can be made.

Series of conferences held

Over the past 18 months, Georgia Power Company has been promoting electric space heating by a method never before used by the company. It is somewhat costly, according to Mr. Yopp but he also says that it has been their most important promotional effort.

A series of thirteen electric space heating conferences has been conducted in the larger cities and towns over the state. These meetings are sponsored by Georgia Power Company and have had the enthusiastic cooperation of the manufacturers of electric resistance heating equipment, heat pumps, insulation materials, and control equipment for electric space heating.

The General Office organized the meetings, handled all contacts with exhibiting manufacturers, prepared and participated in the program along with speakers representing the exhibitors of equipment, and paid all of the expenses.

The Divisions chose the hotel, made the invitation lists and mailed the invitations which were supplied by the General Office. Division sales engineers and their staffs assisted the exhibitors in getting their equipment set up, planned the meals, and acted as hosts to company guests.

The invitations were directed to a select group of people who influence the sale of heating equipment and included architects, engineers, mechanical and electrical contractors, general contractors, builders, electrical and heating in-

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spectors, industrial firms, active residential and commercial prospects, building loan companies and banks, Federal agencies i.e., the FHA and VA, plus key employees of Georgia Power Company.

The invitation envelopes contained an engraved invitation, a program, a general announcement and invitation on Georgia Power Company letterheads signed by the Division Vice-President, an acceptance post card, and a list of the manufacturers who planned to exhibit their equipment.

Planned for busy people

It was planned "big" to capture the attention of the busy people receiving the invitations. The conferences were held in the best hotel having facilities for large dinners and exhibitions. As a rule, the exhibits were placed around the room and the dining tables were set up in the center. A cocktail party (paid for by the exhibitors) was given before dinner in this same area. A good meal was provided, followed by a program on electric space heating.

The program consisted of four speakers whose subjects were: (1) "The Advantages of Electric Resistance Heating; (2) "The Advantages of Heat Pumps," (3) "The Advantages of Insulation," and (4) "Operating Costs of Electric Space Heating."

The first three talks of twenty minutes each were given by experienced speakers from the ranks of the exhibitors. All of them spoke for the group with no tradenames being mentioned. During the Atlanta meetings, these speakers were changed each night so that a new slate appeared each of the three evenings the sessions were held.

The last talk on operating costs, also of twenty minutes, was made by Mr. Yopp at most of the meetings. Each program was in direct charge of the Division sales supervisor. The Division vice-president was always on hand to say a few words which did much to convince Georgia Power personnel in each division that their company definitely wanted the electric heating business.

After the programs, all of the guests were invited to stay and examine the equipment on display. At most of the meetings, half of the guests were still around thirty minutes after adjournment and a fourth were there over forty-five minutes.

Another advantage of this activity was to get everyone connected with the sales and promotion, as well as the design and buying of electric space heating, interested in talking about it. It stimulated interest in the whole subject throughout the area.

The promotion was slanted to cover residential, commercial and industrial applications of electric resistance heating and of heat pumps. In addition, there was a portion of the talk on operating costs devoted to electric resistance process heating. The total expenses were split three ways by the Residential, Commercial, and Industrial Sales Engineering Divisions.

Attendance averaged about 55% of the number of invitations sent out for the Atlanta area, while about 60% of those invited attended the meetings outside of Atlanta. There was no cost to any of the exhibitors except for their share of the expenses of the cocktail parties which was very small. In numbers, the attendance ranged from 102 at Athens, Ga., to 615 in Atlanta. The Atlanta meetings averaged a little over 200 people for each of the three nights.

In all of these meetings, electric resistance heating was featured on an even basis with the heat pump. As a result, seventeen names of electric resistance heating equipment, all with manufacturers' representatives and distribution outlets, are actively pushing electric heating in the Atlanta area.

In the heat pump field, a total of seven manufacturers, their representatives, and distribution organizations are actively selling electrical heating. Five insulation companies are now tying in their sales efforts with Georgia Power Company's heating promotions as are four electric and pneumatic control manufacturing companies.

Officials of the Georgia Power Company are convinced that electric resistance comfort heating, with or without air conditioning, is a product profitable to sell by electric utilities. Adequate sales promotion of electric resistance heating on an equal basis with heat pumps will form an unbeatable combination which in the future will make the use of electricity for heating as common as the use of fossil fuels for that purpose.

Peaking plant

(Continued from page 55)

ly to comply with NEMA Class H and Class F requirements. The single bearing construction is similar to that which we have used for approximately 20 years in heavy duty service.

Excitation is supplied by a regulated static type exciter. This was developed with a view to increasing reliability and eliminating the maintenance and brush problems associated with rotating equipment. This also results in faster regulating response through the elimination of the time lag associated with a rotating exciter.

The function of this type excitation is such that the sensing stage senses the voltage output of the alternator and in turn regulates the input to the alternator field directly. This differs from a rotating type exciter and voltage regulator combination in that the voltage regulator would sense the voltage output of the alternator and in turn regulate the exciter field.

The hood is of heavy duty type construction. The walls and roof are provided with heavy acoustical and thermo insulation. This unit has been sound proofed.

A great deal of development time has been put into the silencing of exhaust discharge, air inlet, and mechanical equipment of this unit. This development work was carried on in conjunction with one of the large utilities in the Midwest.

There are three access doors as well as two sets of double doors provided for access and maintenance of the equipment.

The mounting base of this generator set is fabricated of rolled steel sections and has provisions for lifting and jacking. The design is such that it can be mounted on either three cross piers under the base, or mounting support under the entire base. For minimum installation cost we are recommending that crushed rock and railroad ties be used wherever possible.

The control center which is the "brains" of this power package is contained in a centralized switchgear and control unit. It has been designed to comply with the basic ground rules of extreme reliability, low cost to the utility, and to be most suitable for their application in accordance with the standard practices of a utility system.

Switchgear and control unit

This control unit is 24′ in length, 10′6″ in width, and approximately 11′4″ in height. Its total weight is approximately 34,000 lbs. This unit, like the power generating units, can also be completely assembled and tested at our plant and it is readily transportable to any power plant site. Its design is

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such that it will permit easy maintenance and inspection of the equipment under all weather conditions.

The centralized control unit contains a switchgear and generator control section, two automatic control cabinets, and a battery and battery charger compartment.

The switchgear is of a new design which has been developed to fulfill our specific objectives and yet meet utility standards. It consists of five standardized compartments containing the circuit breakers and coordinated generator control system for the complete generating plant.

The circuit breaker is a 250,000 kva air-magnetic horizontal drawout type and located in the center three compartments. The end compartments contain the auxiliary power transformers, potential transformers, current transformers, protective relays, and meters for the entire power plant. By integrating the control functions, we have reduced the amount of equipment necessary for operating, protecting, and metering of the power plant. For example, one set of meters is used for metering either individual, or the total power plant output.

The super structure on the switchgear houses voltage regulating panels of the regulated static exciters previously mentioned. Behind this is located a set of station lightning arrestors and surge capacitors.

Power take-off connections are available through an access panel to bus bars located above the switchgear. This location seems most suitable for field application in that a utility may connect directly into the transformer, run overhead, or underground.

The automatic control cabinets contain the sequencing control equipment necessary for making this power plant capable of operation as an unattended station. One contains the automatic synchronizer and other master control devices plus an auxiliary power distribution panel and control system annunciators. The other contains unitized automatic sequencing relay panels for the engine-generator sets.

The synchronizer employs static type circuitry and was specifically designed to fill our requirements of fast and accurate synchronization. Relays are a new design with totally enclosed contacts and employ alloy contact materials selected to insure the utmost in reliability.

The battery compartment houses a 120 volt lead acid battery used for engine cranking, circuit breaker operation and control. It is kept fully charged by use of an automatic battery charger.

The housing for this centralized control equipment is of heavy duty construction, designed to fulfill the

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requirements for outdoor type switchgear. Equipment arrangement and housing dimensions are such as to permit circuit breaker withdrawal and maintenance under shelter. All other equipment is readily accessible for servicing.

Having described the equipment assembled in the centralized control unit, I will explain the operation of the automatic control system.

Automatic control system

At initiation of a start signal, the master control energizes the automatic control circuits of Unit #1. The battery is then connected to crank the engine and starting system controls are activated. At engine firing, the governor brings the engine to synchronous speed. Excitation is then applied and the generator voltage is brought up to bus potential. The automatic synchronizer supplies control signals to the governor so as to match the frequency and phase of the generator with that of the bus, then closes the breaker at the moment of synchronism. The voltage regulation system controls the generator excitation to supply a preset value of reactive power as the generating unit advances to full load. The total generating plant is sequenced in a similar manner; total time required from start signal to full load for the entire power plant is within 90 seconds.

A stop signal from either protective devices or stop button will shut the power plant down. On a normal shutdown the breaker will open at 200 kw.

High voltage protection

Adequate protection against system fault has been designed into the generating plant. System fault protection is afforded by relay #51; overvoltage relay #59 detects high generator voltage; relay #67 protects against reverse power, bus differential protection is provided by differential relay #87.

There are several other protective features included such as: sequence failure, field failure, low battery voltage, hot engine, overspeed trip, and lube oil failure.

Field installation

An important design ground rule was to keep the field installation time and cost to a minimum. This is accomplished by our having made the elements of this power plant completely integrated, factory assembled, fully tested and ready for field installation. With a minimum of real estate, approximately 3000 square feet, these elements may be set on a foundation of crushed rock and railroad ties, concrete piers, or any sturdy level base.

Interconnections required consist of a simple fuel piping system from the fuel storage tank and interconnections between each power plant. The interconnecting cables between units can be buried in shallow trenches. If lengths are known, cables can be cut and lugged before shipment. There will be approximately five cables between each power generating unit and the centralized control—three generator and two multiconductor control cables. There will be two grounding cables per unit and grounding interconnections between elements. The output of the MU-60 is then ready to be connected to your system.

The four elements may be purchased from Electro-Motive complete in every way and ready for operation. As pointed out previously, after the units have been placed in position on the system site, the only requirements are to connect the fuel system and interconnecting cables between the power elements and the control center.

ELECTRICAL SOUTH
806 Peachtree St., N.E.
Atlanta 8, Ga.

August, 1958

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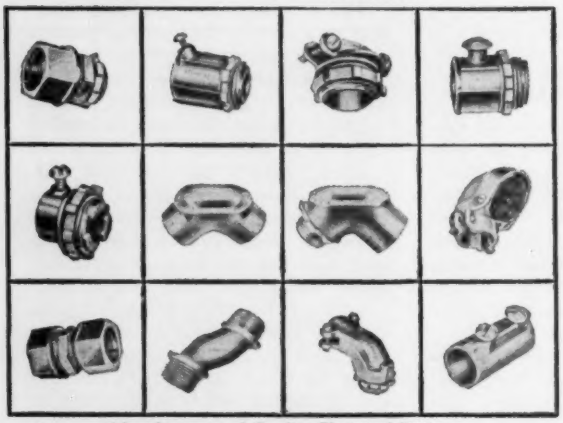

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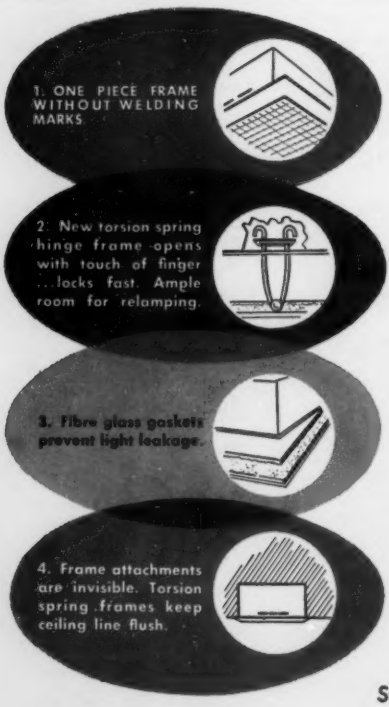
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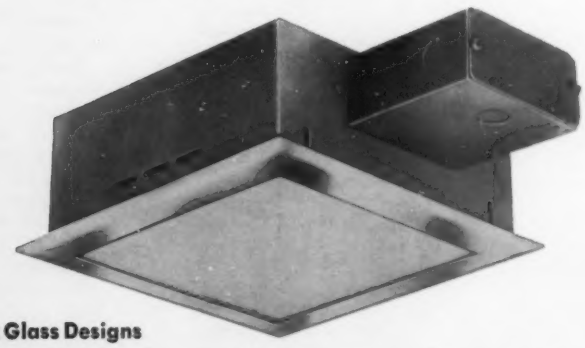

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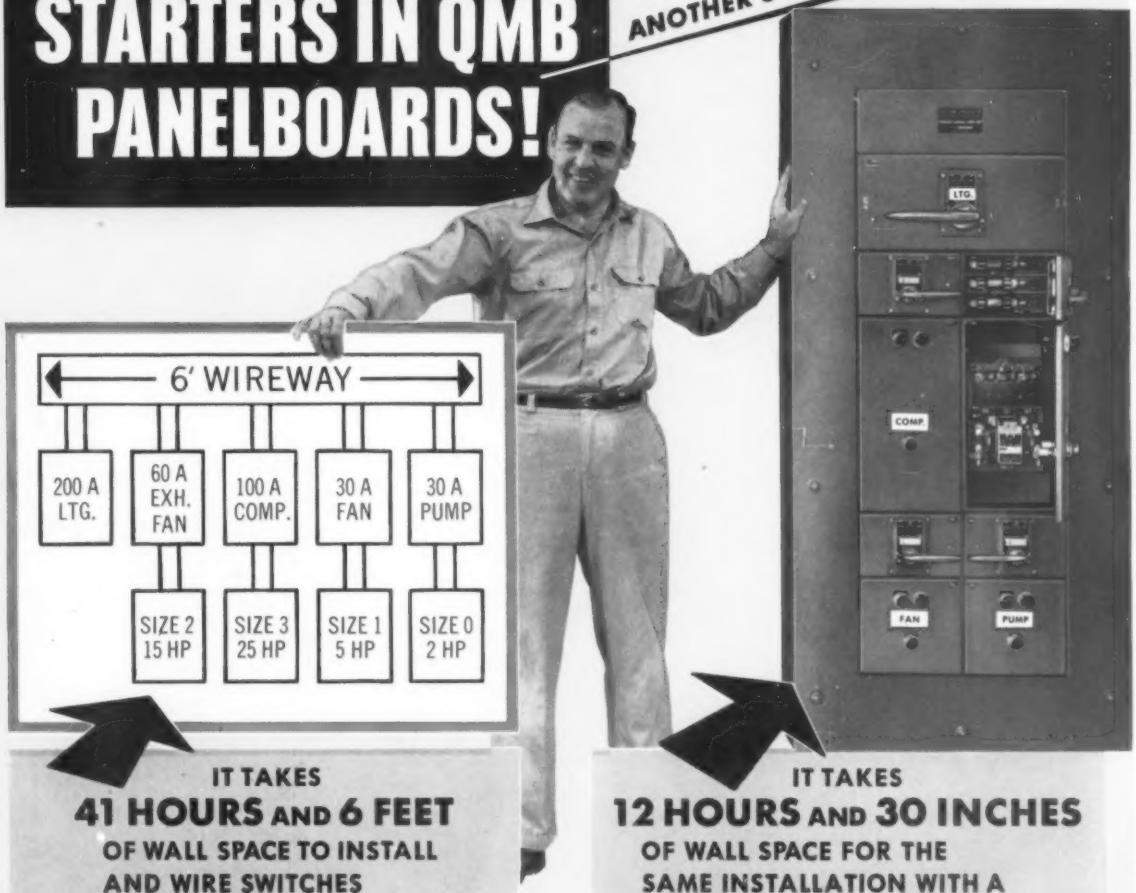

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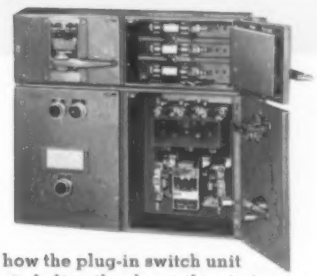
OF WALL SPACE FOR THE SAME INSTALLATION WITH A QMB STARTER PANELBOARD

Why mount separate starters and disconnect switches? It costs extra money. It wastes space. It takes a lot more time. QMB Starter Panelboards give you a *safer* installation because you can't open a starter when the switch is ON. They give you a much *better looking* job. Since they can even be *flush* mounted, they offer a lot more installation *flexibility*. QMB panelboards accommodate reversing and non-reversing starters, sizes 0 through 3. QMB switchboards and unit substations handle sizes 0 through 5. All of them are available, factory-assembled and wired. Or get enclosures, starters and plug-in switch units from your Square D distributor for on-the-job assembly.



Notice how the plug-in switch unit is mounted directly above the starter, permitting interlocking. The starter cannot be opened when the switch is in the "ON" position.

It's easy to order these starter and switch units. See Page 57 in your Square D Digest and order from your distributor.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

MR. EDWARD ACKERMAN
THE MANHATTAN SHIRT CO.

Fusetron dual-element fuses protected 150 motors against burnout when a hurricane single phased our primary line

Edward Ackerman, Chief Electrician
The Manhattan Shirt Co., Paterson, New Jersey

Mr. Ackerman continues . . .

"One afternoon a hurricane struck and single phased the line feeding our plant.

"At the time, all 150 of our sewing machines were in operation. No one suspected the motors were running single phase. Our first warning came when the machines started shutting down through the plant as Fusetron fuses began blowing to protect the motors.

"I had no idea in what condition we would find the motors. It was certainly a relief when we checked and did not find one damaged sewing machine motor. Around 300 Fusetron fuses had blown to protect them.

"You can imagine how costly it would have been to repair or replace these ½ hp., 3 phase, 220 volt motors—and our plant would have been out of business while this work was being done. So we think we paid a very small price when our only expense was replacing the 3-2/10 ampere Fusetron fuses.

"Since this experience, our seven other plants have been informed of the above incident, and it has been suggested to them, that they protect all sewing machine motors with Fusetron dual-element fuses."

For more information on Fusetron dual-element fuses, write for bulletin FIS.

BUSSMANN MFG. DIVISION
McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

FUSETRON
TRUSTWORTHY NAME IN ELECTRICAL PROTECTION
BUSS

850

Play Safe! Install Fusetron dual-element fuses throughout entire Electrical System!